PHYSICS ABSTRACTS

SECTION A

of

SCIENCE ABSTRACTS

SECTION A, PHYSICS

SECTION B, ELECTRICAL ENGINEERING

Edited and Issued Monthly by

THE INSTITUTION OF ELECTRICAL ENGINEERS

In Association with

THE PHYSICAL SOCIETY

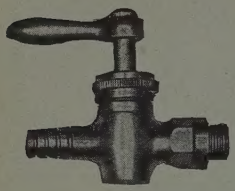
THE AMERICAN PHYSICAL SOCIETY

THE AMERICAN
INSTITUTE OF ELECTRICAL ENGINEERS

ABSTRACTS 965-1171

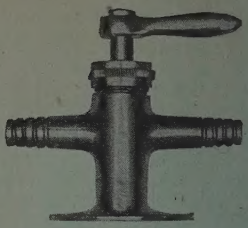
VOLUME 48 **APRIL 1945** NUMBER 568

EDWARDS HIGH VACUUM METAL TAPS



Wall type—straight through pattern

We supply a complete series of precision taps suitable for pressures as low as 0·001 mm. Hg. Many types of wall or bench patterns are available with screw or rubber tube connections.



Bench type—two-way pattern

SPECIAL NOTE—READY SHORTLY!

'HIGH VACUUM' *by J. Yarwood, M.Sc.*

The second edition of this valuable book contains 40% more material than the first edition. It deals with all modern types of Pumps and Gauges, measurement of pumping speeds, industrial application of high vacuum, etc., and includes an extensive bibliography. As a limited number only will be printed, we have made arrangements to ensure a copy is available to those interested in high vacuum practice. Write now if we may reserve a copy for you.

PRICE 12/6d. (Postage 7d.)

W. EDWARDS & CO. (London) Ltd.

Makers of Apparatus for the Production, Utilisation and Measurement of High Vacuum

KANGLEY BRIDGE ROAD, LOWER SYDENHAM, LONDON, S.E.26

Telephone: SYDenham 7026 Telegrams: Edcohivac, Phone, London

CONTENTS—ABSTRACTS 965–1171

		Page
536.7	Thermodynamics	105
.8	Heat engines	105
537	Electricity	105
.12	Electrons	105
.29	Electric fields	106
.3	Currents	106
.31	Conductivity	106
.32	Thermo-electricity	106
.36	Electrocapillarity	106
.5	Discharge	106
.531	X-rays	107
.533	Neg. rays	107
.56	Ionization	107
.59	Cosmic rays	107
538	Magnetism	108
.1	Theory	108
.2	Properties	108
.56	Electromagn. oscill.	108
.6	Magnetic fields	108
539.1	Theory of solids	108
.13	Molecules	108
.15	Atoms	109
.16	Radioactivity	109
.17	Atom. disintegration	109
.2	Mol. systems	110
.24/.27	Microstructure	111
.26	X-ray examination	111
.3	Elasticity	112
.4	Strength	112
.5	Deformability	113
54	Chemistry	113
541.12	Reaction kinetics	113
.128	Catalysis	116
.13	Electrochemistry	117
.14	Photochemistry	119
.18	Colloids	120
.183	Adsorption	121
.2	Atomic theory	123
.4	Compounds	123
541.5	Valency	123
.6	Chem. structure	123
542	Practical chemistry	123
543/545	Analysis	123
548	Crystallography	123
549	Mineralogy	124
55	Geophysics	124
550.37	Terrestr. electricity	124
.38	Terrestr. magnetism	124
.4	Geochemistry	124
.8	Prospecting	124
551.5	Meteorology	125
552	Petrology	126
553	Econ. geology	126
576.7	Histology	126
.8	Parasitology	126
581	Botany	126
591.1	Animal physiology	126
6	Appl. science	126
608.4	Models	126
61	Medical science	126
612	Physiology	126
.84	Vision	126
62	Engineering	126
63	Agriculture	126
66	Industrial chemistry	126
661.713	Cellulose	126
663.6	Water	127
666.1/.2	Glass	127
667	Dyeing	127
669	Metallurgy	128
674	Wood	128
675	Leather. Skin	128
676	Paper-making	128
677	Textiles	128
678	Rubber	128
679.5	Plastics	128
77	Photography	128
78	Music	128

536.7 965

A note on the symmetry of certain thermodynamic relations. CREELY, J. W., LE COMPTE, G. C., AND LUCASSE, W. W. *J. Franklin Inst.*, 235, *pp.* 617–622, *June*, 1943.—The fundamental variables (heat content, intrinsic energy, work content, free energy), (temperature, pressure, entropy, volume), (heat and work) are considered in the 3 bracketed groups. The various thermodynamical relations are then discussed in a manner which reveals the existence of an underlying symmetry and similarity of form. This is emphasized by a diagrammatic grouping of the variables of the first two groups which could serve as a mnemonic for deriving the equations. R. W. P.

536.7 966

The thermodynamic properties of gaseous sulphur trioxide. STOCKMAYER, W. H., KAVANAGH, G. M., AND MICKLEY, H. S. *J. Chem. Phys.*, 12, *pp.* 408–412, *Oct.*, 1944.—The properties are calculated from molecular data. To obtain satisfactory agreement with the equilibrium data for the reaction $SO_2 + \frac{1}{2}O_2 = SO_3$, it is necessary to include vibrational anharmonicities, which are larger than usual because of an accidental degeneracy involving 2 of the normal frequencies. The standard entropy of $SO_3(g)$ at 25°C. is $61{\cdot}2 \pm 0{\cdot}2$ E.U., and its standard heat and free energy of formation from the elements are $\Delta H^\circ_{298.16} = -94{\cdot}43 \pm 0{\cdot}15$ and $\Delta F^\circ_{298.16} = -88{\cdot}48 \pm 0{\cdot}20$ kcal./mole.

536.7 : 536.423 *see Abstr.* 946

536.7 : 536.65 *see Abstr.* 962

536.7 : 539.32 *see Abstr.* 1028

536.7 : 541.123.2.034.6 967

Statistical thermodynamics of mixtures with zero energies of mixing. GUGGENHEIM, E. A. *Proc. Roy. Soc. A*, 183, *pp.* 203–212, *Nov.* 30, 1944.—A general formula has been obtained for the number of distinct arrangements of a mixture of any number of different types of molecules each with its own geometric properties. From this are deduced the thermodynamic properties of such mixtures when the energies of mixing are zero. In particular, the generalization of Raoult's law has been obtained. The technique used is considerably simpler than that previously applied to problems of this type.

536.7 : 541.123.2.034.6 968

Statistical thermodynamics of mixtures with non-zero energies of mixing. GUGGENHEIM, E. A. *Proc. Roy. Soc. A.*, 183, *pp.* 213–227, *Nov.* 30, 1944.—A combinatory formula is obtained for $g(N_i, X_{ij})$, the number of ways of arranging a mixture of any number of kinds of molecules on a lattice, the values of N_i and X_{ij} being specified, where N_i denotes the number of molecules of type i, z denotes the number of sites which are neighbours of one site, and zX_{ij} denotes the number of pairs of neighbouring sites occupied one by a molecule of type i, the other by a molecule of type j. Each molecule of type i is assumed to occupy r_i sites, where r_i is any integer with different values for different types of molecules. This formula is used to derive the thermodynamic properties of mixtures of molecules occupying various numbers of sites, assuming that the intermolecular energy can be regarded as a sum of terms, each pair of neighbours contributing one term. For binary mixtures the formulae obtained are very similar to those previously obtained for "regular" solutions where each molecule occupies one site. A rather simple formula is obtained for the critical temperature and the composition of the critical mixture. The degree of accuracy of the treatment is the same as Chang's use of Bethe's first approximation and as the "quasi-chemical" method of approach. A brief investigation of a higher approximation for a binary regular mixture on a close-packed lattice indicates that the errors due to the approximation used are unlikely ever to be serious.

536.7 : 541.132 *see Abstr.* 1082

536.75 969

The entropies of some aqueous ions. STEPHENSON, C. C. *J. Amer. Chem. Soc.*, 66, *pp.* 1436–1437, *Sept.*, 1944.—The following standard entropies at 298·1°K. have been computed: H_2PO_4' $21{\cdot}6 \pm 0{\cdot}3$; HPO_4'' $-8{\cdot}7 \pm 1{\cdot}0$; PO_4''' -52 ± 2; H_3PO_4 $37{\cdot}6 \pm 1{\cdot}0$; NH_4^+ $26{\cdot}6 \pm 0{\cdot}5$; H_2AsO_4' $28 \pm 1{\cdot}0$; SO_4'' $4{\cdot}4 \pm 0{\cdot}5$; $Ca^{\cdot\cdot}$ $-12{\cdot}7 \pm 0{\cdot}6$ g.cal./deg./mol. W. R. A.

536.75 : 536.62 *see Abstr.* 953–957

536.75 : 536.63 *see Abstr.* 959–961

536.77 970

Catalytic synthesis of pyridine. KLINE, C. H., JR., AND TURKEVICH, J. *J. Amer. Chem. Soc.*, 66, *pp.* 1710–1714, *Oct.*, 1944.—Free-energy values were calculated on the basis of spectroscopic data for various methods of synthesis of pyridine. These methods are discussed.

536.775 : 532.614 *see Abstr.* 869

536.8 971

On the efficiency of power units. EKSERGIAN, R. *J. Franklin Inst.*, 236, *pp.* 541–571, *Dec.*, 1943.—The method used for studying the efficiency of power units such as boilers and turbines is based on a comparison of the output of an actual irreversible engine with that of an ideal reversible engine working between the same temperatures. An appendix deals with the equations of fluid flow. R. W. P.

536.8 : 621.438 972

Thermodynamics of the gas turbine. RENNIE, E. J. C. *J. Instn Engrs, Aust.*, 16, *pp.* 178–186, *Sept.*, 1944.—[Abstr. 911 B (1945)].

537.12 973

Inertia of the carrier of electricity in copper and aluminium. KETTERING, C. F., AND SCOTT, G. G. *Phys. Rev.*, 66, *pp.* 257–267, *Nov.* 1 *and* 15, 1944.—In this experiment the mass/charge ratio of the carrier was precisely determined, by measuring the change in amplitude resulting from reversing the current in a cylindrical coil supported as a torsional pendulum. Determinations of m/e were made for coils of Cu and Al and various current values were used in each coil. The average value obtained for m/e is $5{\cdot}69 \times 10^{-9}$ g/coulomb. The elaborate experimental arrangements are described.

537.12 : 512.972 : 530.12 *see Abstr.* 840, 841

537.291 : 621.385 : 778 974

Photography of rolling steel balls. SPOONER, A. M. *Photogr. J.*, 84, *pp.* 355–357, *Dec.*, 1944.—Electron paths in radio valves, etc., can be investigated by means of a "rubber model" in which small balls roll on a horizontal sheet of rubber deformed vertically. Full details are given of such a model and of its development. Difficulty was experienced in getting photographic records of the tracks (failure to stand out against background) and this problem is discussed at length. A. H.

537.312 : 537.562 :538.566 : 621.396.11 975

On the variation of the high-frequency conductivity of an ionized medium with collision frequency. SINGH, B. N. *Patna Univ. J., Nat. Sci. Sect.*, 1, *pp.* 1–9, *July*, 1944.—Expressions are derived for the h.f. conductivity of the ionosphere for the ordinary and extraordinary waves, on a ray theory. The possibility of reflection at a level of rapidly changing collision frequency is examined in terms of these, and it is suggested that the height of reflection is in fact governed by such changes of conductivity as well as by the value of refractive index. Triple splitting of echoes may be attributed to this cause. F. T. F.

537.312.5 : 535.215.5 976

The photoconductivity of sodium chloride in the far ultra-violet. FERGUSON, J. N., JR. *Phys. Rev.*, 66, *pp.* 220–223, *Oct.* 1 *and* 15, 1944.—Measurements were made on the wavelength dependence of the photoconductivity of an uncoloured NaCl crystal at 900 to 1 350 Å in order to test the theories regarding discrete energy (exciton) levels, lying just below the conduction bands. A region was found between 1 300 and 1 350 Å in which there was large absorption, but very small, if any, photoconductivity or external photo-electric effect, indicating the existence of exciton states. At wavelengths $<1\,300$ Å, both the photoconductivity and the photo-electric effect began to set in and these showed a doublet structure. The photoconductivity rises abruptly at the second absorption peak in the absorption spectrum and shows structure which locates energy levels above the ground state.

537.312.5 : 535.215.5 977

The photoconductance of evaporated bismuth films. WEBER, A. H., AND FRIEDRICH, L. W. *Phys. Rev.*, 66, *pp.* 248–252 *Nov.* 1 *and* 15, 1944.—The electrical conductance of Bi films evaporated on Pyrex in high vacuum was measured when the films were dark and when illuminated with 2 537 Å radiation. A photoconductance effect was observed for all films <292 atom-layers thick, whether the Bi was deposited at room temperature or at liquid-air temperature. The effect disappears with increasing film thickness, more rapidly for films at liquid-air temperature. True photoconductance is not present; the films which exhibit photoconductance are patch-like in structure; the observed photoconductance is assigned to photo-electric emission between film patches.

537.312.6 978

The electrical resistivity of copper-zinc and copper-tin alloys at low temperatures. FAIRBANK, H. A. *Phys. Rev.*, 66, *pp.* 274–281, *Nov.* 1 *and* 15, 1944.—Measurements were taken on both annealed and hard-drawn specimens. For the annealed set, the resistivity varied linearly with the temperature above 70°K. and with a higher power of T at low temperatures, approaching a const. below 20°K. Above 70°K. the value of $(d\rho/dT)$ increases linearly with atomic % solute. The residual resistivity increased with % of added solute for both alloy systems, but not in agreement with Nordheim's theory, unless it be assumed that the effective number of free electrons per atom increases with added solute atoms or that the specimens were not true random solid solutions. The cold work produced some unexpected effects. Although the expected increase of resistivity with residual strain occurred in the Cu-Zn alloys, the specimens of 0–3 atomic % Sn, which were hard-drawn through a 75% reduction and left in the strained state, showed a lower resistivity at low temperatures than did the corresponding annealed, quenched specimens.

537.321 979

The effect of order-disorder on the thermo-electric properties of Ni_3Mn. JAFFEE, R. I. *Phys. Rev.*, 66, *pp.* 288–289, *Nov.* 1 *and* 15, 1944.

537.363 980

Separation of α- and β-casein. WARNER, R. C. *J. Amer. Chem. Soc.*, 66, *pp.* 1725–1731, *Oct.*, 1944.—Casein was separated into α- and β-casein, which represent the 2 peaks in the electrophoretic pattern of casein at *p*H 7. The fractions are not electrophoretically homogeneous under all conditions, but they have been purified so that neither fraction contains any of the other. The electrophoretic experiments were carried out in a Tiselius apparatus equipped with scanning device [Abstrs. 303, 1693 (1940)]. The water-bath was regulated at 0·5°. A tall-form electrophoresis cell was used. Mobilities, reduced to 0°, were calculated for the descending boundaries from measurements made directly on the plates with a precision comparator. The areas of the peaks were determined with a planimeter from enlarged tracings of the patterns.

537.523 : 551.594.221 *see Abstr.* 1148

537.525 : 538.69 981

Spectroscopic investigation of the effect of magnetic field on electrical discharge in gases. KULKARNI, S. B. *Curr. Sci.*, 13, *pp.* 254–255, *Oct.*, 1944.—Application of a magnetic field to a discharge tube, apart from the Zeeman effect, affects markedly the intensity of the glow. Details are given of preliminary experiments on He, Ne and H. As the field strength increases, the line intensity proceeds to a max. and then falls. The field giving max. intensity appears to depend upon the wavelength of the line in question and upon the presence of foreign gases. For a given p.d. across the tube, there is a critical field above which the tube becomes non-conducting. In the case of He the nature of the spectrum (atomic or molecular) is found to be markedly affected by the application of the field. A. H.

537.525.8 : 535.215 982

Influence of the intensity of irradiation on the new light-effect in chlorine under electrical discharge. DEO, P. G. *Indian J. Phys.*, 18, *pp.* 84–87, *April*, 1944. —General conditions for the production of the photo-diminution of the conductivity in Cl subjected to electrical discharge are indicated. The effect

ncreases by increasing the frequency of irradiation, he violet being most active, which happens to be the egion of absorption by Cl. The influence of the ight-intensity on the effect is not linear [see Abstr. 2566 (1944)].

537.525.8 : 535.215 983

The light-effect under electrical discharge: the probable time-lag in its production. JOSHI, S. S. *Curr. Sci.*, 13, *pp.* 253–254, *Oct.*, 1944.—The discharge current was allowed to flow through an iron-core transformer; its secondaries were connected to an amplifier and a loud-speaker. This produced a characteristic group of notes, when the chlorine tube, screened from light, was excited by applying a suitable potential. The volume of sound decreased sensibly on irradiation, and *vice versa* [see Abstr. 2566 (1944)].

537.531 : 535.343 984

The X-ray *K*-absorption edge for sodium and the secondary structure accompanying the edge for the sodium halides. RULE, K. C. *Phys. Rev.*, 66, *pp.* 199–209, *Oct.* 1 *and* 15, 1944.—A high-vacuum, curved-crystal spectrograph is described. Comparison of the $K\beta_x$ emission line and the *K*-absorption edge for metallic Na indicates that the $K\beta_x$ line represents a transition from the $M_{II\,III}$ valence shell. The energies of the 1*s*, 2*p*, and 3*p* electron energy levels are calculated. The energy difference between the $K\beta_x$ emission line and the *K*-absorption edge for Na^+ in NaCl is 5 eV greater than the difference between the $K\beta_5$ emission line and the *K*-absorption edge for Cl^- in NaCl. Strong secondary absorption patterns are found on the short-wavelength side of the *K*-absorption edge for Na^+ in the Na halides. The distances from the max. and min. in the pattern to the main edges are correlated with the lattice distances and agreement with Kronig's hypothesis is found except for the features near the main edge in the spectrum for NaF. Agreement is also found for K^+ in the K halides.

537.531 : 537.533.72 : 535.317 *see Abstr.* 897

537.533.72 : 537.531 : 535.317 *see Abstr.* 897

537.533.73 : 539.133 *see Abstr.* 998, 999

537.561 : 535.343–31 *see Abstr.* 911

537.562 : 538.566 : 621.396.11 : 537.312 *see Abstr.* 975

537.565 985

Exchange forces between Li^+ and He, and the mobility of Li^+ in He. MEYEROTT, R. *Phys. Rev.*, 66, *pp.* 242–248, *Nov.* 1 *and* 15, 1944.—A calculation of the exchange force between Li^+ and He was made with the use of simple hydrogenic state functions to represent the charge distributions of the ion and atom. The force so obtained was added to that arising from the polarizability and the van der Waals interaction between Li^+ and He. The result was used to calculate the mobility of Li^+ in He gas. The theoretical value, 19·4 cm.²/V/sec. at a temperature of 18°C., is lower than the experimental, 25·8 cm.²/V/sec.

537.591.1 986

Slow mesons in cosmic radiation. AIYA, S. V. C., AND SAXENA, R. C. *Phys. Rev.*, 66, *pp.* 183–186, *Oct.* 1 *and* 15, 1944.—Using Bhabha's method, the intensity of slow mesons is determined. The intensity of mesons of energy $>10^8$ eV and $<2{\cdot}7\times10^8$ eV is 6% of the total meson intensity. Near the geomagnetic equator, the total intensity increases by 54·4%, the meson intensity by 21·7%, and the electron intensity by 162·1% when the altitude increases from 3 100 ft. to 7 200 ft. The electron intensity, which is about 25% of the meson intensity at 3 100 ft., increases to 50% of the meson intensity at 7 200 ft.

537.591.1 987

Atom-annihilation cosmic rays at Mexico City. WARREN, D. T. *Phys. Rev.*, 66, *pp.* 252–254, *No.* 1 *and* 15, 1944.—There is a bright line in the primary energy spectrum at Mexico City, such as is predicted by the atom-annihilation hypothesis. Detailed investigation shows, however, that it does not fully agree with the form predicted by Millikan, Neher and Pickering [Abstr. 2202 (1943)]. The peak occurs at too small a zenith angle, and would be observed over too wide a range of latitude. A. J. M.

537.591.1 988

The transition effect of penetrating showers. JÁNOSSY, L., and ROCHESTER, G. D. *Proc. Roy. Soc. A*, 183, *pp.* 181–185, *Nov.* 30, 1944.—Observations of the transition effect of penetrating showers are reported and the effect is found to agree with theory [see Abstr. 2834 (1943), 402 (1944)]. The *Z*-dependence of the transition effect has not been confirmed.

537.591.3 989

On the absorption of the hard component of the cosmic radiation. ROSE, M. E. *J. Franklin Inst.*, 236, *pp.* 9–45, *July*, 1943.—A theory of absorption of mesotrons in the atmosphere and in dense materials at and below sea-level is given, based on the assumptions that absorption is due entirely to energy loss caused by electrical interaction and spontaneous decay, that mesotron production occurs in an equivalent layer 10% below the top of the homogeneous atmosphere, and that scattering can be neglected. The absorption of mesotrons incident vertically on thick layers of rocks enables the energy distribution in the formation layer to be calculated, and from this the sea-level energy distribution for vertical incidence, and the integral energy distribution and angular distribution, are obtained. Results agree best with experiment for a life of about 2×10^{-6} sec. Assuming that the initial angular distribution is isotropic, and that primary energy distribution is independent of the original direction of motion, the agreement with experiment is satisfactory. Absorption in Pb and other materials for vertical incidence is also considered. The calculated absorption in Pb is slightly less than the observed. It is shown that there should be appreciable mesotron production at heights of about 4 000 m., and this is verified by experiment. A. J. M.

537.591.5 990

The barometer effect of penetrating showers. JÁNOSSY, L., AND ROCHESTER, G. D. *Proc. Roy. Soc. A*, 183, *pp.* 186–190, *Nov.* 30, 1944.—The barometer coefficient of penetrating showers is evaluated from an extended series of observations and is found to be $B = -11{\cdot}7 \pm 2{\cdot}7\%$ per cm. Hg. The significance of the correlation coefficient is discussed briefly [see Abstr. 2835 (1943)].

537.591.5 991

Some aspects of the production of mesons and the barometer effect of penetrating showers. JÁNOSSY, L. *Proc. Roy. Soc. A*, 183, *pp.* 190–202, *Nov.* 30, 1944.—It is shown that the large barometer effect of penetrating showers can be understood in terms of an exponential absorption of the primaries giving rise to the showers. A number of other experimental results favour such an assumption. It is shown further that the exponential absorption of the primaries is compatible with theory [Abstr. 2834 (1943)] when account is taken of fluctuations.

538.12 : 621.3.013 992

Production of uniform magnetic field by a pair of magnetic dipoles. CRITTENDEN, E. C., JR., AND MCDANIEL, B. D. *Rev. Sci. Instrum.*, 15, *p.* 270, *Oct.*, 1944.

538.214 993

The magnetic properties of tourmaline and epidote. SIGAMONY, A. *Proc. Indian Acad. Sci. A*, 20, *pp.* 200–203, *Oct.*, 1944.—The magnetic susceptibility and anisotropy and the density of 11 differently coloured tourmalines and of 2 specimens of epidote were measured. Dark-coloured tourmalines had higher values for these quantities than rose-coloured specimens, the susceptibility varying from $13{\cdot}4$ to $0{\cdot}58 \times 10^{-6}$ and anisotropy from $2{\cdot}1$ to $0{\cdot}01 \times 10^{-6}$. The two epidotes had susceptibilities of $22{\cdot}7$ and $23{\cdot}6 \times 10^{-6}$ and anisotropy $< 0{\cdot}5\%$ of the susceptibility. W. R. A.

538.214 994

Magnetic behaviour of iron pyrites. SIGAMONY, A. *Proc. Indian Acad. Sci. A*, 20, *pp.* 204–209, *Oct.*, 1944.—45 specimens of iron pyrites from Nepal were examined. They were tin-white in colour; one, on analysis, was found to contain $47{\cdot}8\%$ of Fe; the sp. gr. of 6 gave the value of $5{\cdot}02$. Susceptibility values varied from $\sim 0{\cdot}2$ to $\sim 190 \times 10^{-6}$, most specimens having values in the lower range and all showing decrease with increase in field strength. One specimen of a darker colour, owing to alteration into limonite, had high but field-independent values of susceptibility. One specimen from each group was examined and each was found to be independent of temperature. Low-susceptibility crystals were magnetically isotropic, whilst high-susceptibility crystals were anisotropic. One of the high-susceptibility crystals was tested and found to have no remanent magnetism. W. R. A.

538.214 : 541.128.1 *see Abstr.* 1074

538.214 : 552.52 : 621.317.44 : 550.384.3 *see Abstr.* 1137

538.242 995

New researches in gyromagnetism. BARNETT, S. J. *Phys. Rev.*, 66, *pp.* 224–225, *Oct.* 1 *and* 15, 1944.

538.566 : 537.562 : 621.396.11 : 537.312 *see Abstr.* 975

538.69 : 537.525 *see Abstr.* 981

539.1 966

Atomic and molecular theory since Bohr: logical and mathematical survey. MARGENAU, H., AND WIGHTMAN, A. *Amer. J. Phys.*, 12, *pp.* 247–268, *Oct.*, 1944.

539.132 997

The quantum-mechanical Hamiltonian for the linear polyatomic molecule treated as a limiting case of the non-linear polyatomic molecule. NIELSEN, H. H. *Phys. Rev.*, 66, *pp.* 282–287, *Nov.* 1 *and* 15, 1944.—The corresponding wave equation does not lend itself to an exact solution and the actual Hamiltonian must be replaced by its expansion. When the Hamiltonian is expanded on the basis that the displacement of the particles from equilibrium is small compared with the equilibrium positions of the particles, the results of Shaffer and Nielsen are obtained. In the case of linear XY_2 molecules, the equilibrium value of the moment of inertia $I_{zz}^{(e)} = 0$ so that the displacements of the particles normal to the axis z must be considered large compared with the values of equilibrium co-ordinates x_i^0 and y_i^0 of the nuclei. If the molecule is considered as very nearly linear and the Hamiltonian is expanded on the hypothesis that $\mu q^2 \gg I_{zz}^{(e)}$, μ being the reduced mass and q being the normal co-ordinate, the results of Dennison for the linear XY_2 molecular model are approached asymptotically as $I_{zz}^{(e)}$ approaches zero.

539.132 : 535.338.41 *see Abstr.* 902

539.133 : 537.533.73 998

The molecular structures of phosphoryltribromide thiophosphoryltribromide, thiophosphorylmonofluorodibromide, and thiophosphoryldifluoromonobromide. SECRIST, J. H., AND BROCKWAY, L. O. *J. Amer. Chem. Soc.*, 66, *pp.* 1941–1946, *Nov.*, 1944.—The usual electron-diffraction method was employed on the vapour of the compound. A constant wavelength of $0{\cdot}0592$ Å for the electron beam was used, the camera distance varying between $99{\cdot}0$ and $101{\cdot}5$ mm. Temperatures were maintained sufficient to furnish v.p. of 50–100 mm. at the time of photographing. To reach this v.p. in the case of $POBr_3$ and $PSBr_3$, a special electrical heating coil was used around the sample holder to maintain temperatures at 50°–60°. All bond distances are shorter than the corresponding sums of atomic radii. In $POBr_3$ the P–Br distance is shorter and the BrPBr angle larger than in any of the other compounds containing P and Br. W. R. A.

539.133 : 537.533.73 999

The structures of biphenyl, *o*-terphenyl and tetraphenylene. KARLE, I. L., AND BROCKWAY, L. O. *J. Amer. Chem. Soc.*, 66, *pp.* 1974–1979, *Nov.*, 1944.—The electron diffraction photographs were obtained using a high-temperature nozzle consisting of a monel metal cylinder closed by a screw cap in which a very tiny hole was bored. The cylinder was heated by a heater wire wound around it and a thermocouple was attached near the hole where the vapour escaped into the path of the beam. 8–12 photographs were taken of each compound at a camera distance of 10 cm. and an electron wavelength of $0{\cdot}0594$ Å. Temperatures of 105°, 145° and 200° were used for biphenyl, *o*-terphenyl and tetraphenylene, respectively. Investigations revealed the non-coplanarity of *o*-terphenyl (I) and tetraphenylene (II) and the possibility for the non-coplanarity of biphenyl (III). In (I) the average position of the 2 attached rings is orthogonal to the central ring with possible oscillations of 15° from the normal position, whereas in (III) much larger oscillations from the normal position probably occur. The cyclooctatetraene (IV) ring is non-coplanar with bonds alternating in length around the ring. The shorter bonds are common to the 6-membered rings. The C_6H_6 rings are directed

lternately above and below the average plane of the olecule, and the external bonds form angles of 120° ith the rings. This indicates that the substituted ng of (IV) is not conjugated, as is C_6H_6. The verage bond distance in aromatic rings in each ompound is $1{\cdot}39 \pm 0{\cdot}02$ Å. If the rings are regular, e distance between them is $1{\cdot}52 \pm 0{\cdot}04$ Å. The onjugation effect on the inter-ring distances is robably small. W. R. A.

39.133 : 541.124.7 : 541.56 *see Abstr.* 1121

39.133 : 541.57 1000

The relation between the force constant and the nteratomic distance of a diatomic linkage. Wu, ., K., and Yang, C.-T. *J. Phys. Chem.*, 48, *pp.* 95–303, *Sept.*, 1944.—A semi-empirical relation $K_e = -b(m)(m+1)/R_e^{m+2} + bm/pR_e^{m+1}$ between he force constant, K_e, and the internuclear distance, R_e, is derived from an assumed potential function $V = ae^{-R/p} - b/R^m$ for the diatomic linkage, and ound to be satisfactory for a large number of diatomic nolecules. The values of b, p, and m are characteristic onstants of a molecular period. A graphic method is levised to evaluate them. The value of m is 4 for eriods 00, 01, 02, and 11, and 6 for periods 12 and 22, espectively, while b and p have different values for ifferent periods.

39.152.1 1001

On the meson field theory of nuclear forces and the cattering of fast neutrons by protons. III. Hulthén, L. *Ark. Mat. Astr. Fys.*, 31 *A*, *No.* 15, 11 *pp.*, 944.—A continuation of previous papers [Abstr. 1147 1944)]. Recent experimental results are at complete ariance with the symmetrical meson-field theory of Møller and Rosenfeld and further evidence is obtained or the author's contention that this difficulty will ffect any theory of the symmetrical type. Those heories are considered where the terms of dipole type tensor forces) are essential for the neutron-proton nteraction. A study is made of the angular distribu- ion of high-energy neutron-proton scattering in Born pproximation, starting from the symmetrical pseudo- calar and vector meson-field theories separately; and lso from the modified Møller–Rosenfeld theory roposed by Schwinger [Abstr. 1605 and *Phys. Rev.*, 51, 387 (1942)] in which a pseudoscalar and vector ield are combined in such a way that the $1/r^3$ singu- arity of the nuclear interaction is eliminated but the ipole terms are retained. Using the Born approxima- ion, no cut-off prescription is necessary because the ivergencies appearing in the separate integrals eutralize each other. L. S. G.

539.155.2 : 541.144.7 *see Abstr.* 1096

539.166.2 1002

High-energy gamma-ray from radio-yttrium (100d). Gamertsfelder, G. R. *Phys. Rev.*, 66, *p.* 288, *Nov.* 1 and 15, 1944.

539.166.7 1003

The absorption of gamma-radiation in copper and ead. Cork, J. M., and Pidd, R. W. *Phys. Rev.*, 66, *pp.* 227–230, *Nov.* 1 *and* 15, 1944.—The energies of he γ rays (1·14 eMV from Zn^{65}, 1·30 eMV from Co^{60}, nd 1·38–2·85 eMV from Na^{24}) were determined by he β-ray spectrometer. The absorption coefficients or Zn and Co agree with the values calculated by Heitler. For the high-energy component of the Na radiation, values of 0·285 cm.$^{-1}$ and 0·405 cm.$^{-1}$ were obtained for the absorption coefficients in Cu and Pb, respectively. Since absorption in Cu at this energy is due almost entirely to Compton scattering, it is indicated that the Klein–Nishina formula is not completely valid.

539.169 : 535.376 : 553.621 1004

Coloration and luminescence produced by radium rays in the different varieties of quartz, and some optic properties of these varieties. Choong, S. P. *Proc. Phys. Soc., Lond.*, 57, *pp.* 49–54, *Jan.*, 1945.—After exposure to β- and γ-rays, the crystals of all 4 varieties of quartz turn to different shades of black. The persistence of the coloration under heat treatment depends on the variety. The same rays render vitreous quartz of the 4 varieties violet. Under radium rays, all the specimens of quartz, crystalline and vitreous, fluoresce and thermophosphoresce in bluish-green or bluish-white light, with the exception of crystalline rose quartz, which emits orange light. Under heat treatment, coloration and thermophosphorescence do not disappear simultaneously, the latter being more persistent. The coloration and the luminescence caused by X-rays are the same as those produced by radium rays, and the ionizing ultra-violet radiations have a very marked decolorizing effect on the smoky quartz, but have no similar effect on the artificial violet colour of vitreous quartz. Among the naturally and artificially coloured specimens of quartz, the violet vitreous quartz is the only one which possesses a band structure in its ultra-violet absorption spectrum. In passing from the naturally colourless quartz to the 3 decolorized varieties, the limit of ultra-violet transparency recedes from $\lambda = 1\,850$ Å to the vicinity of $\lambda = 2\,250$. Among the decolorized specimens of the 3 coloured varieties, crystalline and vitreous quartz of the smoky variety are the most transparent and the rose variety the least.

539.169 : 576.8.095 1005

Action of radioactive substances on the speed of growth of penicillium notatum and the production of a potent penicillin. Jahiel, R., Guberman, E., and Kazdan, R. *Science*, 100, *p.* 298, *Sept.* 29, 1944.

539.172 1006

***K*-electron capture in radioactive argon A^{37}.** Weimer, P. K., Kurbatov, J. D., and Pool, M. L. *Phys. Rev.*, 66, *pp.* 209–214, *Oct.* 1 *and* 15, 1944.—A radioactive gas possessing a half-life of $34{\cdot}1 \pm 0{\cdot}3$ days was produced by bombarding solid samples containing K, Cl, Ca, or S. The observed data require that this activity be assigned to A^{37} in accord with the following reactions: $K^{39} + H^2 \rightarrow A^{37} + He^4$, $Cl^{37} + H^2 \rightarrow A^{37} + 2n$, $Cl^{37} + H^1 \rightarrow A^{37} + n$, $S^{34} + He^4 \rightarrow A^{37} + n$, $Ca^{40} + n \rightarrow A^{37} + He^4$. Alpha-bombardment of Cl failed to produce a measurable quantity of this activity by an (α, d) reaction. The detection of 4·72 Å Cl $K\alpha$ X-rays by means of critical absorption measurements in gaseous compounds of Cl and S reveals that A^{37} decays by *K*-electron capture. Cloud-chamber observations and Al absorption measurements indicate that *K*-electron capture accounts for more than 99·9% of the total number of disintegrations. The probability of the X-ray quantum being internally converted is $0{\cdot}96 \pm 0{\cdot}03$. No γ-rays were observed.

539.172 1007

Nuclear excitation functions. I. $Na^{23}(d,p)Na^{24}$, $Br^{81}(d,p)Br^{82}$, and $Br(d,2n)Kr$(34 hr.). CLARKE, E. T., AND IRVINE, J. W., JR. *Phys. Rev.*, 66, *pp.* 231–241, *Nov.* 1 *and* 15, 1944.—Excitation functions were obtained by bombardment of a stack of NaBr films obtained by evaporation in high vacuum onto Al foil. Deuteron-energy determinations were made by measurement of range in Al; the max. deuteron energy used was 13·5 eMV. The activities of each isotope were measured on a calibrated γ-ray counter which yielded 3 excitation curves and the abs. disintegration rates for the Na^{24} and the Br^{82} whose disintegration schemes are known. The reaction $Br^{81}(d,p)Br^{82}$ exhibits an excitation function which begins at about 3 eMV, rises to a max. abs. cross-section of $3{\cdot}8 \times 10^{-25}$ cm.^{2} at 8·5 eMV, and decreases with further increase in energy. The excitation of the reaction $Na^{23}(d,p)Na^{24}$ shows the same shape but begins at about 1 eMV and reaches max. ($4{\cdot}7 \times 10^{-25}$ cm.^{2}) at 6 eMV. The reaction $Br(d,2n)Kr$ shows a definite threshold at 5·3 eMV and rises almost linearly with increase in deuteron energy. The angular momentum with which the compound nucleus is formed is an important factor influencing the competition for the disruption of the compound nucleus.

539.214.9 : 624.13 1008

Soil-pressure distribution along flexible foundations. BULL, A. *J. Franklin Inst.*, 233, *pp.* 559–580, *June*, 1942.—The problem of determining the soil-pressure distribution along a flexible slab transmitting its load to an elastically yielding ground is approached by two methods. One employs an approx. mathematical treatment; the other uses a model in which the slab is represented by a stretched wire and the soil by a number of stretched rubber bands. Details of both methods are presented. G. E. A.

539.214.9 : 624.19 1009

Determination of lateral passive soil pressure and its effect on tunnel stresses. DRUCKER, M. A. *J. Franklin Inst.*, 235, *pp.* 499–512, *May*, 1943.—A tunnel, when constructed, tends to increase in horizontal dia. and diminish in vertical dia. until sufficient lateral passive resistance is developed. The author derives formulae from which the lateral passive soil pressure and its effects may be obtained for any given set of conditions. Application of the analysis is illustrated by means of worked-out examples. G. E. A.

539.215.5 : 541.18.043 *see Abstr.* 1101

539.216 : 666.11 1010

The behaviour of laminated and toughened glass under static bending and impact at different velocities. HAWARD, R. N. *J. Soc. Glass Technol.*, 28, *pp.* 133–151, *June*, 1944.—The bending of laminated glass with hard cellulose interlayers is not very different from that of sheet glass, but when a soft vinal interlayer is used, the apparent mod. of elasticity is reduced. When broken under impact just heavy enough to crack at least one of the glasses, laminated glass with a cellulose acetate interlayer again behaves in a manner similar to that of sheet glass. The interlayer resists splintering. At higher energies of impact, laminated glass is brittle. The capacity of laminated glass to resist a blow of a given energy is increased at velocities $>$ 20 m.p.h. Under bending, thermally toughened glass behaves as sheet glass, except that the bending strength is approx. doubled. Under slow impact, the strength is large, but as the incident velocity is increased above 20 m.p.h., there is a reduction in strength.

539.216.1 : 532.69 1011

Separation of fibres by physical methods. LASSÉ, R. *Melliand Textilber.*, 24, *pp.* 466–470, 1943.—The technique for the separation of textile fibres by selective flotation in mixtures of organic liquids is described in great detail. The method is rapid, requires little sample (2 cm.^{2}), and applies to almost all textile mixtures. The range of the method is extended by the use of selective solvents for certain fibres and by devices which alter the density or floatability of one of a mixture of fibres having similar densities; e.g. by the defatting of wool fibres and the deposition of colloidal Au, Ag or Cu on the fibres, respectively. The densities of various fibres and of suitable liquids for separating them are tabulated. J. G.

539.216.1 : 539.26 *see Abstr.* 1024

539.216.1 : 667.11 : 677.21 1012

Chloramine and native spinning fibres. HALLER, R. *Melliand Textilber.*, 25, *pp.* 54–58, *Feb.*, 1944.—Cottonseed contains an unidentified substance which produces HCl with chloramine and which is absent from the native fibre. In presence of proteins, hypochlorite bleaching agents can form chloramine, which has a deteriorating effect on strength, but fibres which in practice undergo first an alkaline kier boil and then a treatment with a hypochlorite, do not lose strength appreciably by reason of its formation. Such loss of strength, where it occurs, is associated with the formation of oxycellulose. J. G.

539.216.1 : 667.13 1013

A century of mercerizing. DÖHLE, W. *Melliand Textilber.*, 24, *pp.* 430–434, 1943.—A literature review, having special reference to the chemical and physical changes undergone by the fibres, the theory of mercerization, and the determination of the degree of mercerization. Chemical evidence indicates the formation of at least 2 types of alkali-cellulose complexes, both of which produce hydrocellulose after a regeneration process. X-ray evidence indicates a reorientation of the crystallites comprising the cellulose fibre and changes in their distances apart; and microscopical methods show that the fibres become thicker and denser. The relative merits of methods of estimating the degree of mercerization from the adsorption affinity towards dyestuffs, from X-ray measurements and from chemical reactivity, are compared. J. G.

539.216.1 : 676.1 1014

Additional weight factors of pulps. GRAFF, J. H. *Paper Tr. J.*, 119, *TAPPI Sect.*, *pp.* 155–156, *Oct.* 12, 1944.—In the evaluation of mixtures of fibres in pulps or papers by counting the average numbers in fields observed under the microscope, it is necessary to multiply the % of each fibre estimated to be present by a wt. factor, in order to obtain the % present by wt.; this corrects for differences in fibre dimensions. Standard wt. factors are given for 42 fibres. J. G.

539.216.1 : 677.3 1015

On the action of formaldehyde on animal fibres LEHMANN, E. *Melliand Textilber.*, 25, *pp.* 1–7

an., 1944.—Keratin may be dissolved out of animal bres by the action of 30% formaldehyde. If the ction occurs at 150° in a sealed tube for 2–3 hr. the pidermal membrane may be separated completely rom the main stem of the hair, in a condition suitable or chemical and microscopical examination. In ontrast with existing opinion, it is considered that his membrane has essentially a true membrane tructure, and that the generally accepted porous-net tructure is a secondary phenomenon. The epi-ermal membrane is analogous to the bast of the lant stem, and plays a protective rôle in all animal bres. J. G.

539.217.1 : 666 1016

The variation of apparent porosity through a slip-ast sillimanite tank-block. BOOW, J., AND WALKER, J. E. *J. Soc. Glass Technol.*, 28, *pp.* 152–157, *June*, 1944.—Determinations were made with 45 pecimens taken from different parts of a slip-cast illimanite tank-block, and they were repeated after he samples had been subjected to each of 3 successive refiring treatments at 1 500° for 4 hr. The mean value for the whole block was 20·3%. Prolonged iring decreased the porosity.

539.217.3 1017

Water vapour permeability of water-sensitive materials. BRABENDER, G. J. *Paper Tr. J.*, 119, *TAPPI Sect.*, *pp.* 160–163, *Oct.* 19, 1944.—With triple-ply glassine laminated with 2 films of micro-crystalline wax, the TAPPI standard method is open to error because the surfaces tend to absorb moisture which cannot penetrate the wax. As a result, the sample is distorted in the testing dish; a prolonged period is necessary for equilibrium to be reached, both by the sample during the preliminary conditioning and by the assembly during the test; and there is a low rate of change in wt. due to true water transfer. Precise control of temperature and humidity is essential. The test dish is replaced by a seamless spun Al ring (height 1·0 in.) having 2 open faces, in which discs of sample, with about 20 g. of desiccant between, are sealed with G-grade rosin 75%+ unbleached beeswax 25%. The use of de-hydrogenated rosin or microcrystalline wax (Socony Products 2305) for sealing reduces errors due to the change in wt. of the seal. J. G.

539.217.3 : 542.67 1018

Measurement of rate of flow of water through filter paper. BOGATY, H., AND CARSON, F. T. *J. Res. Nat. Bur. Stand., Wash.*, 33, *pp.* 353–362, *Nov.*, 1944.—A method is described for measuring the rate of filtration of water through filter papers, in which the paper is used as a cone in the usual manner and special apparatus is not required. An equation is derived, with which a water-filtration coefficient is determined from the filtration data. Data are presented to show the effect of continued filtration on this coefficient. A correlation is shown between the air permeability of filter paper and the rate of filtration.

539.217.3 : 677.46 1019

Rubberizing rayon fabric webs. II. KEHREN. *Melliand Textilber.*, 24, *pp.* 234–237, *May, and pp.* 274–277, *June*, 1943.—Ordinary methods of testing water resistance are unsatisfactory for rubberized rayon fabrics because the principal cause of leakage arises from cracks. Treatment of the fabric with formaldehyde before rubberizing raises water-resistance, but reduces the resistance to rubbing and cracking. The use of a stronger weft thread (e.g. made from a thicker thread or a better grade of rayon) gives good results. The strength of rubberized rayon fabrics falls as the water-content increases. Test data are tabulated. J. G.

539.217:5.08 1020

Apparatus for measuring rate of gas penetration through food-packaging materials. SMITH, F. R., AND KLEIBER, M. *Industr. Engng Chem.* (*Analyt. Edit.*), 16, *pp.* 586–587, *Sept.*, 1944.

539.23 1021

Mechanical properties of films from amylose, amylopectin, and whole starch triacetates. WHISTLER, R. L., AND HILBERT, G. E. *Industr. Engng Chem.*, 36, *pp.* 796–798, *Sept.*, 1944.—Amylose triacetate readily forms high-quality films having good tensile strength and pliability; amylopectin triacetate resembles whole starch triacetate in forming only weak, brittle films. Adequate plasticization of the amylose triacetate films can be accomplished by the addition of 10–20% of plasticizer of the types employed with cellulose acetates.

539.24 : 621.357.7 1022

Study of the deposition potentials and microstructures of electro-deposited nickel-zinc alloys. LUSTMAN, B. *Trans. Electrochem. Soc.*, 84, *pp.* 363–375, 1943.—[Abstr. 827 B (1945)].

539.24 : 674.049 *see Abstr.* 1170

539.26 1023

Electron and X-ray diffraction study of the grain-boundary substance in cadmium. MILLER, B. L. *J. Franklin Inst.*, 237, *pp.* 443–450, *June*, 1944.—The grain-boundary material in commercial Cd samples was isolated by dissolving Cd laminae in NH_4NO_3 solution, the boundary substance remaining as insoluble films. Electron-diffraction patterns of the films, using 40–50 kV electrons, and X-ray diffraction patterns of powders of the films by CuK_α radiation, were obtained. From a knowledge, given by spectrographic analysis, of the elements present, the diffraction patterns were identified as those of $CdCO_3$ and basic $PbCO_3$. These carbonates may not have existed in the metal, but may have been converted from oxides in the metal during dissolution of the laminae. N. M. B.

539.26 : 539.216.1 1024

X-ray diffraction studies on protein fibres. I. The large fibre-axis period of collagen. BEAR, R. S. *J. Amer. Chem. Soc.*, 66, *pp.* 1297–1305, *Aug.*, 1944.—Small-angle diffractions of 26 collagenous tissues of vertebrate animals were examined. All show a characteristic large fibre-axis period of 640 Å in dry material and varying from 615–680 Å, depending on treatment. Relative diffraction-order intensities differ between moist and dry samples, wet samples showing striking alternation of intensities with odd orders predominant. This suggests that normally the electron-density distribution along a collagen fibril consists of a primary, slowly changing, nearly cosinusoidal variation in density, having a period of 640–680 Å. On these, secondary fluctuations are

superimposed, the most prominent being sub-periods (70–110 Å) in extension along the fibril, whilst in dry samples the orders extend, indicating considerable regularity in structure. This regularity can be disturbed by chemical and physical methods so that small-angle X-ray diffraction is no longer observed. There appears to be no relation between variations in the large period and diffractions observed at wider angles. The long spacings of collagen seem to be related to certain colloidal properties of the protein. W. R. A.

539.31 : 539.501 1025

A general stresss/strain/time formula. NUTTING, P. G. *J. Franklin Inst.*, 235, *pp.* 513–524, *May*, 1943.—The general law of deformation, $S = at^nF^m$, relates the strain S to the time t and stress F. The constant a represents the deformability. For a perfectly elastic body $n = 0$ and $m = 1$; for a perfect fluid $n = 1$ and $m = 1$. Elastic yield and mobility both depend primarily on the constant a. The properties required for paints, dough and lubricants are expressed by variations in the values of a, n and m. Relaxation begins with the strain and continues after the stress is released, and there is absence of a definite time limit. G. E. A.

539.31 : 539.893 1026

The compressibility of media under extreme pressures. MURNAGHAN, F. D. *Proc. Nat. Acad. Sci., Wash.*, 30, *pp.* 244–247, *Sept.*, 1944.—A theory of stress/strain is given which yields a formula that is valid over a much greater range than Hooke's Law. Some calculated numerical results are compared with experimental values due to Bridgman [Abstr. 2225 (1941)] who gave data for Li up to 100 000 atm. It is concluded that to compress Li to a density 10 times the original, a pressure of $6{\cdot}5 \times 10^6$ atm. is necessary. L. S. G.

539.31 : 678 1027

An elastic theory for rubber. LATSHAW, E. *J. Franklin Inst.*, 234, *pp.* 63–73, *July*, 1942.—Hooke's law fails to indicate large strains in rubber accurately. The modulus E is defined as for zero strain, and the amended law is: $p = Ef$ (strain). All grades of spring rubbers (vulcanized under high pressure and sp. gr. approx. 1) do not possess the same strain function. The author considers vulcanized rubber to be made up of very small unit cells approx. equal in composition. The grouping of the cells is pictured as consisting of a core cell surrounded by 6 tube cells; the latter are apparently quite rigid and resist distortion. The ratio: stress/strain is expressed by means of secant laws for compression and tension, of which Hooke's law is a special case. Tests are cited in support of the theoretical elastic-strain laws, and the strain-equation graphs are followed accurately by 3 rubbers up to very high strain values. G. E. A.

539.32 : 536.7 1028

Elastic behaviour of metals near the melting point. RAO, M. R. *Curr. Sci.*, 13, *p.* 255, *Oct.*, 1944.—The harmonic oscillator model for solids and liquids, and the assumption that there is no discontinuity between their internal degrees of freedom, leads to the relation $v_K/v_L = \frac{4}{3}e^{\lambda_m/3kT_m}$, where v_K and v_L are the velocities of sound in the solid and liquid metals, λ_m is the molecular heat of melting, and T_m the m.p. in deg. abs. The average experimental value of the ratio for Cd, Hg, Pb and Sn is 2·02, on the basis of Stierstadt's results, whilst the mean calculated value is 2·06. R. W. P.

539.32 : 624.13 = 3 1029

Deformation law in soil mechanics. BENDEL, L. *Schweiz. Bauztg*, 124, *pp.* 41–43, *July* 22, 1944.—Hooke's law holds for solid rock but not for soils. The elastic modulus for soil depends on the magnitude of the load and also whether the load is increased or decreased. The law derived by the author, applicable to both rock and soil foundations, gives the specific sinking of the ground as $K \log [(\sigma_a + \sigma)/\sigma_a]$ where K is a factor depending on the stiffness of the soil, σ_a is the previous applied load, and σ the added load, in kg./cm.^{2} A worked example and measurements of K and σ_a are given in verification of the theory. G. E. A.

539.382 1030

Elasticity of keratin fibres. BULL, H. B., AND GUTMANN, M. *J. Amer. Chem. Soc.*, 66, *pp.* 1253–1259, *Aug.*, 1944.—The stress/strain relations of human hair in pure H_2O are investigated. The process is essentially irreversible, but up to 20% stretch the behaviour is reproducible. Beyond 18% stretch, irreparable damage to the hair takes place. Elasticity increases with rising temperature in the region of Hooke's law, whilst in the 20% stress/strain loop it decreases with rising temperature. The newer structure of α-keratin, proposed by Astbury (*Nature*, 1941, 147, 696), is criticized and it is suggested that α-keratin has close packing of successive alternate amino-acid residues along the peptide chain. Stretching from 3–20% appears to involve a process similar to thixotropic sol-gel transformation. W. R. A.

539.388.8 : 678 1031

Effect of deformation on the swelling capacity of rubber. FLORY, P. J., AND REHNER, J., JR. *J. Chem. Phys.*, 12, *pp.* 412–414, *Oct.*, 1944.—Elongation of swollen vulcanized rubber, or other polymeric materials possessing random network structures, should increase the amount of liquid absorbed at equilibrium with an excess of the swelling agent. According to the thermodynamics of stretching and swelling of rubber [Abstr. 445 (1944)], the rel. volume of the swollen rubber at equilibrium should equal (the relative stretched length)$^{\frac{1}{3}}$. Experiments with butyl rubber vulcanizates in xylene support these predictions.

539.4.01 : 676 1032

Effect of writing inks on the strength of paper. BRECHT, W., AND LIEBERT, E. *Papierfabrikant*, 41, *p.* 330, 1943.—Papers treated with a logwood ink or with inks containing synthetic dyes showed no appreciable strength loss after artificial ageing in an air-current at 80°C. for 100 hr. With other logwood inks and with all iron-gallate inks there was an appreciable reduction in tearing strength (an indication of lack of permanence). There was no marked influence on breaking length, stretch, or bursting- or tearing-strengths. In general, the deleterious effects were greater for the harder sized papers. J. G.

539.4.016 : 621.315.52 : 669.1 *see Abstr.* 1168

539.4.016.2 : 669.14 : 621.907 1033

Effect of grain size and sub-zero treatment on productivity of four high-speed steels. DEPOY, S. M.

Trans. Amer. Soc. Mech. Engrs, 66, *pp.* 645–648, *Nov.*, 1944.—The effect was studied by a series of turning tests on one alloy steel at a preselected uniform hardness. The material being cut, the shape of the tool bit, and the speed, feed, and depth of cut on the turning operation were held constant. Standard and sub-zero treatments were used at different hardening temperatures to develop different grain sizes and different hardening products. The results obtained show that the grain size, carbide solution, and type of martensite formed in the tool, have a very marked effect on its cutting ability. Sub-zero treatment is more effective when large grain sizes are developed.

539.4.016.3 : 669.14 1034

Physical properties of some national-emergency steels. STEWART, W. C., AND WILEY, R. E. *Iron Age*, *pp.* 59–74, *Dec.* 14, *and pp.* 54–58, *Dec.* 21, 1944.—Abstr. 987 B (1945)].

539.42 : 621.791 = 3 1035

Effect of inclination of seam welds on tensile strength. ZSCHOKKE, H., AND MONTANDON, R. *Schweiz. Arch. angew. Wiss. Tech.*, 10, *pp.* 129–137, *May*, 1944.—Abstr. 931 B (1945)].

539.501 1036

Rheological properties of asphalt. TRAXLER, R. N., SCHWEYER, H. E., AND ROMBERG, J. W. *Industr. Engng Chem.*, 36, *pp.* 823–829, *Sept.*, 1944.—The flow characteristics of 27 asphalts from different sources and processed by various methods were evaluated in rotary viscometers. Consistencies of each asphalt at fixed temperatures were determined at 2 or more mean rates of shear. If an asphalt is a complex liquid, the measured consistency decreases as the rate of shear is increased. The degree of complex flow may be evaluated by c in the equation, $M = F/S^c$; c is unity for asphalts that are simple (Newtonian) liquids but varies from unity for those that are complex liquids. The type of flow (and, if complex, the degree) depends on the source of the asphalt, the method and degree of processing, the age of the sample, and the temperature at which the evaluation is made.

539.501 : 539.31 *see Abstr.* 1025

539.501 : 620.1.08 1037

A study of constant-stress rheometers. CAFFYN, J. E. *J. Sci. Instrum.*, 21, *pp.* 213–216, *Dec.*, 1944.—Rheometers in which the tensile or compressive force changes as the cross-sectional area of the sample changes, can be made, utilizing the bent lever for the application of the tensile or compressive force. The equations governing the operation of the instruments are deduced for deformations at constant volume, from which the amount of deformation, the initial and final height or length of sample, and the working range of the instrument, can be obtained.

539.54 : 669.144 1038

The development of controlled hardenability. BISCHOFF, W. G. *Steel*, *pp.* 98–99 *et seq.*, *Oct.* 16, 1944.—The end-quench test, devised by Jominy, and Grossman's method of calculation from the chemical analysis and grain size are discussed, and the problem of using these methods in specifications of steels is presented. M.-V.

539.62 1039

The nature of static friction. CLAYPOOLE, W., AND COOK, D. B. *J. Franklin Inst.*, 233, *pp.* 453–463, *May*, 1942.—Friction is the effect of a varying combination of a large number of factors; these are discussed so far as they have been used by previous investigators. The pertinent factors in systems with ideal surfaces are considered, and the discussion is related to the best practicable conditions obtainable. G. E. A.

539.62 : 621.822.1 1040

Static and clinging friction of pivot bearings. HUNTER, M. C. *Proc. Instn Mech. Engrs, Lond.*, 151, 3, *pp.* 274–284, 1944. *Abstr. in Engineering* 157, *pp.* 117–120, *Feb.* 11, *and pp.* 138–140, *Feb.* 18, 1944.—Describes special apparatus used in the investigation carried out to determine the static friction of various combinations of metals, including stainless steel and duralumin, under several conditions of dry and viscous lubrication. The paper gives data showing the rapid growth of the coefficient of friction during the first 24 hr. at rest, and the subsequent increases over a period of 5 days. A series of long-term tests of 30, 60, and 90 days, on a selected number of specimens, provides a direct comparison from which the relative merits of the various combinations of materials is drawn. Evidence is provided suggesting advantages to be derived from the use of graphite as a preventive of clinging friction.

539.893 : 539.31 *see Abstr.* 1026

541.121 : 541.62 *see Abstr.* 1123

541.123.1 1041

Phase equilibria in hydrocarbon systems. REAMER, H. H., OLDS, R. H., SAGE, B. H., AND LACEY, W. N. *Industr. Engng Chem.*, 36, *pp.* 956–958, *Oct.*, 1944.—The volumetric behaviour of ethane was investigated at pressures up to 10 000 lb./in.^{2} between 100° and 460°F. The results are presented in tabular and graphical form. Comparisons are made with values obtained by others and with extrapolations based on the Beattie–Bridgeman equation of state.

541.123.2 : 536.423.1 1042

Vapour-liquid equilibria of close-boiling binary hydrocarbon mixtures. RICHARDS, A. R., AND HARGREAVES, E. *Industr. Engng Chem.*, 36, *pp.* 805–808, *Sept.*, 1944.—A min. constant-boiling mixture is formed by benzene–2,4-dimethylpentane, giving an azeotrope boiling at 75·2°C. and 757 mm. and containing 54·5 mole % benzene, and by the system benzene-cyclohexane, giving an azeotrope boiling at 77·4°C. and 759 mm. and containing 51·5 mole % benzene.

541.123.2 : 669.14 = 6 1043

Iron-carbon equilibrium diagrams. DELPECH, S. A. *Publ. Fac. Cienc. Fis.-Mat. La Plata*, 3, *pp.* 189–219, *Oct.*, 1944.—A theoretical study is made of various types of thermal equilibrium diagrams of binary alloys. The examination is thence extended to a study of the two iron-carbon systems, iron-cementite and iron-graphite. Thermal treatments of carbon steels are discussed from the viewpoint of the foregoing analyses in relation to the microstructure of these steels. R. M.

541.123.2.034.6 : 536.7 *see Abstr.* 967, 968

541.123.3 1044

Ternary liquid equilibria predicted from binary vapour-liquid data. TREYBAL, R. E. *Industr. Engng*

Chem., 36, *pp.* 875–881, *Oct.*, 1944.—The graphical method proposed by Hildebrand for predicting ternary liquid equilibria from activity coefficients of binary solutions was applied to a number of systems, using const. pressure and const. temperature vapour-liquid equilibrium data, and azeotropic measurements. Two modifications to allow for mutual solubility of the contacted solvents are tested. A simple analytical method of calculating an index of the usefulness of a proposed solvent in extraction processes for which no ternary data are available is described.

541.123.3 : 669.018 1045

Equilibrium of the ternary system bismuth–lead–zinc. MUZAFFAR, S. D., AND CHAND, R. *J. Amer. Chem. Soc.*, 66, *pp.* 1374–1380, *Aug.*, 1944.—In this system a tertiary eutectic is formed with 55% Bi, 43% Pb and 2% Zn. Its f.p. is 124°. By addition of 10–15% or more of Zn to the miscible binary alloys of Bi and Pb, the ternary alloys become immiscible.

541.123.31 : 535.324 1046

The ternary system *n*-butyl-alcohol–benzene–water at 25°C. and 35°C. WASHBURN, E. R., AND STRANDSKOV, C. V. *J. Phys. Chem.*, 48, *pp.* 241–245, *Sept.*, 1944.—Solubility determinations and tie-line data are recorded in tables. This system differs from others in that the alcohol and water, as well as the hydrocarbon and water, have limited miscibility in each other at the temperatures employed. It represents the opposite of the methyl–alcohol–cyclohexane–water system. As the total amount of alcohol is increased, the proportion going into the benzene-rich layer increases continuously.

541.123.4 1047

Distribution of iodine between heavy water and carbon tetrachloride. CHANG, T. L. *J. Amer. Chem. Soc.*, 66, *pp.* 1940–1941, *Nov.*, 1944.—Iodine distributes itself between D_2O and CCl_4 in the molarity ratio 1 : 103 at infinite dilution at 25° as compared with the corresponding distribution of 1 : 85 for H_2O. W. R. A.

541.123.5 : 541.127.2 1048

A study of some reactions between dry inorganic salts. VI. The reciprocal system CsCl + KBr ⇄ CsBr + KCl below the fusion temperature. VOGT, J. W., WITH WOOD, L. J. *J. Amer. Chem. Soc.*, 66, *pp.* 1259–1262, *Aug.*, 1944.—When an equimolar mixture of CoCl and KBr (reactive pair) was heated for 3 days at 477°, an equilibrium was produced as represented by CsCl + KBr ⇄ CsBr + KCl. An equilibrium mixture having this same composition was obtained when an equimolar mixture of CsBr and KCl (balanced pair) was heated for 3 days at the same temperature. When either CsCl or KBr was added to the equimolar mixture of the reactive pair before heating, the equilibrium shifted to the right in quantitative agreement with the law of mass action. When either CsBr or KCl was added to the equimolar mixture of the balanced pair before heating, the equilibrium shifted to the left in quantitative agreement with the law of mass action.

541.123.52 1049

Exchanges of halogen and hydrogen between organic halides and isoparaffins in the presence of aluminum halides. BARTLETT, P. D., CONDON, F. E., AND SCHNEIDER, A. *J. Amer. Chem. Soc.*, 66, *pp.* 1531–1539, *Sept.*, 1944.—A mechanism for the halogen-hydrogen exchange is proposed whereby a carbonium ion is depicted as removing H: from the tertiary position in an isoparaffin. The exchange is thus regarded as an intermolecular analogue of a process for which there is evidence in intramolecular rearrangements.

541.123.59 : 541.132 *see Abstr.* 1083

541.123.61 1050

The quaternary system CaO–Al_2O_3–$CaSO_4$–H_2O at 25°C. Equilibria with crystalline $Al_2O_3 . 3H_2O$, alumina gel, and solid solution. JONES, F. E. *J. Phys. Chem.*, 48, *pp.* 311–356, *Nov.*, 1944.—Further work [*Trans. Faraday Soc.*, 35, *p.* 1484, 1939] was carried out to determine the stable and metastable equilibria involving crystalline $Al_2O_3 . 3H_2O$. The work thus provides the necessary data for the fundamental system involving crystalline $Ca(OH)_2$ and crystalline $Al_2O_3 . 3H_2O$ as solid phases. In addition, equilibria with alumina gel in solutions of high lime concentrations were determined, and solid solution equilibria investigated. Reference is made to the attack of calcium sulphate on concrete.

541.123.7 1051

The quinary system CaO–Al_2O_3–$CaSO_4$–K_2O–H_2O (1 per cent KOH) at 25°C. JONES, F. E. *J. Phys. Chem.*, 48, *pp.* 356–378, *Nov.*, 1944.—As compared with the system CaO–Al_2O_3–$CaSO_4$–H_2O at 25°C. in spite of the considerable modifications in solution compositions, the compound $C_3A . 3CaSO_4 . 32H_2O$ is still the only quaternary stable solid phase. The application of the equilibria relations found in the present work to the conditions existing in a setting Portland cement is discussed.

541.123.7 1052

The quinary system CaO–Al_2O_3–$CaSO_4$–Na_2O–H_2O (1 per cent NaOH) at 25°C. JONES, F. E. *J. Phys. Chem.*, 48, *pp.* 379–394, *Nov.*, 1944.—The results are similar to those already found for the corresponding 1% KOH system [see Abstr. 1051 (1945)].

541.124 : 517.944 *see Abstr.* 788

541.124 : 541.64 1053

Copolymerization. I. A basis for comparing the behaviour of monomers in copolymerization; the copolymerization of styrene and methyl methacrylate. MAYO, F. R., AND LEWIS, F. M. *J. Amer. Chem. Soc.*, 66, *pp.* 1594–1601, *Sept.*, 1944.—A study of the copolymerization of styrene and methyl methacrylate by a free-radical mechanism at 60° indicates that the monomer reactivity ratios are independent of the composition of the monomer mixture, the extent and rate of conversion, small quantities of certain added materials, moderate proportions of benzene and ethyl acetate as solvents, and the presence or absence of benzoyl peroxide as catalyst. The equation developed permits calculation of the products of copolymerization and accurate comparison of the rates of reaction of a series of monomer molecules with a chosen radical.

541.124 : 541.64 1054

The polymerization of styrene in phenolic solvents. WALLING, C. *J. Amer. Chem. Soc.*, 66, *pp.* 1602–1606, *Sept.*, 1944.—The rate is affected by air and by

benzoquinone and bears no simple relation to the acid strengths of the phenols as measured in water, and the polymer is of low mol. wt. In thymol the rate is third-order and inversely ∝ the conc. of thymol. In *m*-cresol the rate lies between second and third order.

541.124.7 : 539.133 : 541.56 *see Abstr.*-1121

541.124.7 : 541.127.1 1055

Thermal rates and activation energies for the aqueous acid hydrolysis of α- and β-methyl-, phenyl-, and benzyl-D-glucopyranosides, α- and β-methyl- and β-benzyl-D-fructopyranosides, and α-methyl-D-fructofuranoside. HEIDT, L. J., AND PURVES, C. B. *J. Amer. Chem. Soc.*, 66, *pp.* 1385–1389, *Aug.*, 1944.—The Cu reduction method of Shaffer *et al* (*J. Biol. Chem.*, 1933, 100, p. 695) was used to investigate the hydrolyses of (initially) 0·01 M solutions of glucosides (from 45° to 96° by 0·1 *N* HCl and fructosides (from 15° to 60°) by 0·01 *N* HCl. First-order rate constants are expressed by $\log k^* = \log a^* - b/T$ (a^* and b are constants). Activation energies are largest for glycosides which hydrolyse most slowly. The significance of a constant difference of 5·8 ± 0·5 k./cal. per mol between the activation energies of gluco- and fructo-pyranosides of opposite glycosidic configuration is discussed; pairs having the same configuration exhibit no relationship. The activation energies of α- are > those of β- methyl- and benzyl-glucopyranosides, but in phenyl-glucopyranosides and methyl-fructopyranosides the energies of α- are < those of the β- forms. Activation energies in α- β- gluco- and fructo-pyranosides decrease and rates of hydrolyses increase in the order: methyl, benzyl, phenyl. The ratio $2{\cdot}3b/\log a^*$ has a constant value for each type of glycoside. This ratio, activation energies, and relative rates of hydrolyses, depend on the structure of the sugar residue rather than on the structure of the aglycone. W. R. A.

541.126 1056

The breaking of multiple bonds and the primary detonating explosives. CARL, L. R. *J. Franklin Inst.*, 235, *pp.* 553–575, *June*, 1943.—With the object of understanding initial detonating materials and sensitivity in general, a survey of available literature of the multiple bond and its rupture indicates that the initiators are endothermic crystalline compounds inherently in a strained condition and chemically unstable; they are more susceptible to breaking than other compounds, and their energy is released most reliably as detonation by a mechanical impact. The instability due to the inherent strained condition can be increased by the application of a mechanical stress from an outside source, and this indicates that the inherent strain and the imposed strain are identical in their effect on stability. Chemical reaction must be, in most cases, a two-phase phenomenon, the first phase of which is breaking. N. M. B.

541.127 1057

Kinetics of the acid-catalysed esterification of phenyl- and *cyclo*hexyl-substituted aliphatic acids in methanol. SMITH, H. A., AND BURN, J. *J. Amer. Chem. Soc.*, 66, *pp.* 1494–1497, *Sept.*, 1944.—*Cyclo*hexyl-, di*cyclo*hexyl-, phenylethyl-, diphenyl-, and triphenyl-acetic, β-*cyclo*hexylpropionic, γ-*cyclo*hexylbutyric, and δ-phenylvaleric acids were investigated. The rate of esterification is governed by the total number of substitutions in the α- or β-positions, but exceptions may arise from multiple α-substitution, resonance, the inductive effect of an α-phenyl group, and joining of the β-C atoms. W. R. A.

541.127 1058

The kinetics of the hydrion-catalysed esterification of some substituted benzoic acids with *cyclo*hexanol. HARTMAN, R. J., HOOGSTEEN, H. M., AND MOEDE, J. A. *J. Amer. Chem. Soc.*, 66, *pp.* 1714–1718, *Oct.*, 1944.—Esterification rate constants for 22 substituted benzoic acids with *cyclo*hexanol were measured, and the values for *m*- and *p*-substituents agree with those predicted by the Hammett equation. The energy of activation increases with the non-exponential factor of the Arrhenius equation, and the ascertained data verify the relation $\log PZ = E^{-1/2} + \text{const.}$ W. R. A.

541.127 1059

The kinetics of the sulphonation of some aromatic compounds by sulphur trioxide. DRESEL, E., AND HINSHELWOOD, C. N. *J. Chem. Soc.*, *pp.* 649–652, *Dec.*, 1944.—The kinetic investigation of the sulphonation of aromatic compounds by SO_3 in solutions of nitrobenzene is extended to the reactions of benzene, bromobenzene, *m*-dichlorobenzene, α-nitronaphthalene, and *p*-nitroanisole. All reactions are found to be of the second order with respect to SO_3 and to exhibit the characteristic retardation by the product. The first order with respect to the aromatic reactant, which had been anticipated, is confirmed experimentally. Except with *p*-nitroanisole, the effects of substituents on the rate of sulphonation are accounted for by changes in activation energy, and a correlation is found between such changes and the electronic effects of substituents as measured by dipole moments.

541.127.1 1060

Pressure dependence of the rate of gasification of carbon. WARNER, B. R. *J. Amer. Chem. Soc.*, 66, *pp.* 1306–1309, *Aug.*, 1944.—New experimental proof is given for the existence of isotherms and saturation pressures in the reaction between steam and C. These isotherms are of the form similar to the adsorption of a monomolecular layer of a gas on a solid adsorbent [see Abstr. 2887 (1943)]. W. R. A.

541.127.1 1061

The reaction velocity of ion exchange. NACHOD, F. C., AND WOOD, W. *J. Amer. Chem. Soc.*, 66, *pp.* 1380–1384, *Aug.*, 1944.—The measurement at various temperatures of reaction rates of cation and anion exchangers shows that the reactions are second order and values could be calculated by using concentrations instead of activities. Cation exchange reactions have a faster rate than anion exchange reactions, indicating different reaction mechanisms. Commercial ion exchangers display non-uniform behaviour. Rate data permit prediction of operating characteristics and required contact periods for different temperature and exchange unit design. W. R. A.

541.127.1 1062

Kinetics of the reaction of cerium^{IV} and arsenic^{III} ions. MOORE, J. W., AND ANDERSON, R. C. *J. Amer. Chem. Soc.*, 66, *pp.* 1476–1479, *Sept.*, 1944.—The rates of reaction of Ce^{IV} and As^{III} ions in aq. H_2SO_4

and with added $HClO_4$, HNO_3, HCl, halogenides, quinone and $MnSO_4$, were measured, and the rate-determining step is third order. In H_2SO_4 the rate is greatly reduced owing to the formation of a complex between the Ce^{IV} and SO_4''. $MnSO_4$ may catalyse the reaction and make a bimolecular mechanism possible. W. R. A.

541.127.1 1063

The interpretation of the effects of salts on the rates of some hydrolytic reactions. Olson, A. R., and Tong, L. K. J. *J. Amer. Chem. Soc.*, 66, *pp.* 1555–1562, *Sept.*, 1944.—Rates of hydrolysis of acetal, dimethyl acetal, and dipropyl formal, and the rate of decomposition of nitramide, were determined in a variety of solutions. Salt effects do not conform with the Brønsted equation. A theory of salt effects based upon the orientation and polarization of H_2O molecules by salt ions is postulated and applied to explain the mechanisms of the reactions studied. W. R. A.

541.127.1 1064

The kinetic analysis of consecutive irreversible first-order reactions. Swain, C. G. *J. Amer. Chem. Soc.*, 66, *pp.* 1696–1700, *Oct.*, 1944.—A generalized graphical method is developed whereby the rate constants of two consecutive first-order reactions, $A \xrightarrow{k_1} B \xrightarrow{k_2} C$, may be computed from a set of experimental data comprising the measurement of the formation or consumption of any substance which is produced or consumed in equal amount in each step. The solution is in the form of a table of k_2/k_1 *v.* k_1t for different percentage reactions. If the data for 2 different percentage reactions are plotted on 2 semi-transparent sheets of log. graph paper, and one of them is laid over the other, displacing the abscissae by an amount = the ratio of the lines for the two percentage reactions, k_2 and k_1 are obtained from the k_2/k_1 and k_1t values of the intersection. An example is given. W. R. A.

541.127.1 1065

The diacetone-alcohol–hydroxide-ion reaction from the standpoint of ion-dipole theory. Amis, E. S., Jaffé, G., and Overman, R. T. *J. Amer. Chem. Soc.*, 66, *pp.* 1823–1826, *Nov.*, 1944.—Rate constants for the decomposition of diacetone alcohol in solutions of 3 alkaline hydroxides, alone and in the presence of 17 alkali salts, agree with the theoretical equation [Abstr. 3114 (1942)]. The data gave not only a change in the sign of slope but also an inversion of the curvature of the empirical curves. Four alkali salts give anomalous results which could not be explained. The rate of this reaction in ethyl-alcohol–water and *n*-propyl-alcohol–water agrees reasonably well with theory.

541.127.1 1066

Measurement of the rate of reaction of potassium iodide with organic chlorides in dilute acetone solution. Senior, K. L., Hetrick, R. R., and Miller, J. G. *J. Amer. Chem. Soc.*, 66, *pp.* 1987–1988, *Nov.*, 1944.—The specific rates of reaction between KI and benzyl chloride in dilute $COMe_2$ increase irregularly with increasing dilution when measured by the analytical method based on the Andrews titration procedure. This is traced to interference of acetone. At high conc. of reactants no interference occurs. A potentiometric method which overcomes the difficulty is described. W. R. A.

541.127.1 : 536.664 1067

The hydration of unsaturated compounds. XII. The rate of hydration of β,β-dimethylacrolein and its equilibrium with β-hydroxyisovaleraldehyde. Lucas, H. J., Stewart, W. T., and Pressman, D. *J. Amer. Chem. Soc.*, 66, *pp.* 1818–1821, *Nov.*, 1944.—β,β-dimethylacrolein hydrates in dilute aq. NHO_3 at a rate which is first order with respect to the aldehyde and to the acid catalyst. The reaction comes to equilibrium. In 1 *N* acid the hydration is 25% at 35°, 28% at 25°, and 32% at 20°. The position of equilibrium is not noticeably affected by changes in the acid concentration. The heat of hydration of β,β-dimethylacrolein, ΔH, is $-3{\cdot}2$ k.cal., the heat of activation of the hydration, $\Delta H_1^{\ddagger}$, is $19{\cdot}1$ k.cal. and the heat of activation of the dehydration of β-hydroxyisovaleraldehyde, $\Delta H_{-1}^{\ddagger}$, is $22{\cdot}4$ k.cal. per mole.

541.127.1 : 541.124.7 *see Abstr.* 1055

541.127.2 : 541.123.5 *see Abstr.* 1048

541.128.1 1068

The hydrogenation of ethylene, propylene, and 2-butene on iron catalysts. Emmett, P. H., and Gray, J. B. *J. Amer. Chem. Soc.*, 66, *pp.* 1338–1343, *Aug.*, 1944.—Preliminary results of measurements on the kinetics, temperature coefficient, and influence of promoters on the hydrogenation of C_2H_4, C_3H_6, and 2-butene over 6 catalysts are presented. W. R. A.

541.128.1 1069

The catalytic reduction of nitrocinnamic acids and esters. Blout, E. R., and Silverman, D. C. *J. Amer. Chem. Soc.*, 66, *pp.* 1442–1443, *Sept.*, 1944.—A method is described for the selective catalytic hydrogenation of aromatic nitro groups in preference to aliphatic double bonds conjugated with a benzenoid ring. The method has been applied to the preparation of aminocinnamic acids and esters.

541.128.1 1070

Hydrocarbon reactions in the presence of cracking catalysts. II. Hydrogen transfer. III. Cyclohexene, decalin and tetralin. Bloch, H. S., and Thomas, C. L. *J. Amer. Chem. Soc.*, 66, *pp.* 1586–1594, *Sept.*, 1944.—Using *n*-octenes as the starting material, a synthetic cracking catalyst can cause H transfer in the absence of added cycloparaffins. The H transfer results in the formation of paraffin and aromatic hydrocarbons and a carbonaceous catalyst deposit poor in H.

541.128.1 1071

Hydrocarbon reactions in the presence of cracking catalysts. IV. Removal of side chains from aromatics. Thomas, C. L., Hoekstra, J., and Pinkston, J. T. *J. Amer. Chem. Soc.*, 66, *pp.* 1694–1696, *Oct.*, 1944.

541.128.1 1072

Catalytic vapour-phase oxidation of picolines over vanadate catalysts. Lewis, R. W., and Brown, O. W. *Industr. Engng Chem.*, 36, *pp.* 890–893, *Oct.*, 1944.—The vapour-phase oxidation of β-picoline over 5 metallic vanadate catalysts was studied; α- and γ-picolines were oxidized over the most efficient catalyst. Working conditions of each catalyst were determined by studying the effect of temperature,

atio of reactants, and velocity of reactants over the atalyst. The best results were obtained over a tin anadate catalyst which gave 22·6% nicotinic acid at 75°C., with a 9 : 1 mole ratio of O to β-picoline.

541.128.1 1073

Mechanism of catalytic hydrogenation and dehydrogenation of aldehydes and alcohols. BADIN, E. J., AND PASCU, E. *J. Amer. Chem. Soc.*, 66, *pp.* 1963–1968, *Nov.*, 1944.—Catalytic dehydrogenation of (−)2-methylbutanol-1 and hydrogenation of (+)2-methylbutanal-1 using Ni catalysts between 128° and 250° yield optically active products at low temperatures and increasingly racemized products as the temperature is raised. Racemization (or "enolization") of the optically active aldehyde on a metal surface containing adsorbed H_2 occurs at a fast rate. Mechanisms are suggested. W. R. A.

541.128.1 : 538.214 1074

The catalytic action of cupric ion on the oxidation of ascorbic acid in pyridine solution. TYSON, G. N., JR., AND WILEY, J. W. *J. Amer. Chem. Soc.*, 66, *pp.* 1936–1937, *Nov.*, 1944.—Using magnetic susceptibility measurements it is shown that, in the absence of O_2, two Cu^{++} ions quantitatively oxidize ascorbic acid in C_6H_5N) to dehydroascorbic acid (I) with production of 2 Cu^{+} ions and 2 H^{+} ions. When Cu^{I} dehydroascorbate is oxidized by atmospheric O_2, the Cu^{+} ions are oxidized to Cu^{++} but the (I) is not attacked. Differences in colour suggest formation of different complexes between the acids and the Cu^{+} and Cu^{++} ions. W. R. A.

541.128.1 : 541.621 *see Abstr.* 1124

541.128.1 : 678.7 1075

Vulcanization of GR-I. BALDWIN, F. P., TURNER, N. B., AND ZAPP, R. L. *Industr. Engng Chem.*, 36, *pp.* 791–795, *Sept.*, 1944.—The most rapid sulphur vulcanization of GR-I requires the use of ultra-accelerators. Increase of accelerator conc. above certain points produces inferior original physical properties with no advantage in cure rate. An excess of ZnO over that necessary to obtain max. tensile is required to produce the max. in modulus and vulcanizate stability. For low-temperature curing, the metal salt accelerators should be used, alone or in conjunction with other accelerators, to obtain fast cure rate. Reversion is apparent in GR-I vulcanizates if curing times are long enough or temperatures are high enough. Decreasing the rate of vulcanization with less active accelerators delays appearance of the reversion phenomenon.

541.128.3 1076

The catalytic oxidation of ethylene to ethylene oxide. REYERSON, L. H., AND OPPENHEIMER, H. *J. Phys. Chem.*, 48, *pp.* 290–295, *Sept.*, 1944.—The finely divided Ag and the Ag on fused Al_2O_3 showed an optimum activity in the conversion of ethylene to ethylene oxide in the range 260°–290°C. Addition of steam lowered the activity of these catalysts slightly. Changes in space velocity of the gases did not greatly affect their efficiency. In the absence of steam, the Ag–silica gel catalysts showed low activity and no temperature optimum. The presence of 50% steam doubled the efficiency, and they showed an optimum efficiency in the same temperature range as the other two catalysts.

541.128.5 : 576.8.095 1077

Inhibition of metal catalysis as a fungistatic mechanism. ZENTMYER, G. A. *Science*, 100, *pp.* 294–295, *Sept.* 29, 1944.—The fact that micro-organisms require traces of several metal elements indicates that these elements are involved in catalytic processes in the cells, i.e. that the metals function as part of one or more enzyme systems. Hence a chemical capable of precipitating the metals in such enzyme systems should prevent growth of micro-organisms by inhibiting metal catalysis, particularly if metals are precipitated in the form of chelate inner complex salts which are non-electrolytes. 8-hydroxyquinoline, which forms such chelate salts with many metals and is also an efficient fungistatic and bacteriostatic compound, is now tested biologically to ascertain if the latter property is the result of the former. At low *p*H values, where complex formation does not take place, 8-hydroxyquinoline does not inhibit growth; Zn, which is the most important essential trace element for the vascular pathogens, should be removed by 8-hydroxyquinoline and growth prevented, whereas growth should be resumed when additional zinc is supplied, and this was found to be the case. The above theory is thus justified and has been supported by the reactions of other (e.g. cupferron) similar reagents. H. H. HO.

541.13 1078

Diffusion potentials and mobilities of multivalent ions: potassium ferricyanide and ferrocyanide. PRIDEAUX, E. B. R. *J. Chem. Soc.*, *pp.* 606–611, *Nov.*, 1944.—The potentials, E_d, at various kinds of liquid junction between solutions of K_2SO_4, $K_3Fe(CN)_6$ and $K_4Fe(CN)_6$, severally, were determined by various methods. These potentials are $\propto \log C_I/C_{II}$, C_I and C_{II} being the concentrations. When extrapolated to zero conc., the E_d values are nearly equal, and the transport numbers t_- and mobilities l_- agree with those determined by conductivity. The equivalent mobilities ${}_0l_-$ of $\frac{1}{4}[Fe(CN)_6]^{4-}$ and $\frac{1}{3}[Fe(CN)_6]^{3-}$ are in the ratio 1·11 : 1. In solutions of higher conc., the E_d values for the two salts diverge and are so related that the transport numbers of the two salts become equal when the conc. is 0·1*N*; beyond this, the value for the ferrocyanide probably falls below that for the ferricyanide. The data are interpreted on the assumption that the only ions present are the K and the ferro- or ferri-cyanogen. Calculations based on the existence of an intermediate ion, $[KFe(CN)_6]^{3-}$ although satisfactorily explaining the t_- and λ values, do not accord well with the observed diffusion potentials.

541.132 1079

Influence of common ion on the dissociation of some electrolytes. I. Sulphuric acid and bisulphates. RAO, N. R. *Indian J. Phys.*, 17, *pp.* 283–286, *Oct.*, 1943.—The influence of common ions on the dissociation of H_2SO_4 and bisulphates was studied by the Raman spectra of mixtures of these solutions with other acids which supply H ions, and with normal sulphates which supply the SO_4 ions. It was observed that, while the addition of H ions suppressed the dissociation in all these cases, the addition of the SO_4 ions to the bisulphate solutions helped further dissociation of the HSO_4 produced on dissolving the

bisulphate in water. The latter result contradicts the law of mass action. N. M. B.

541.132 1080

Demineralization of water by ion exchange. MANNERING, W. E. *Paper Tr. J.*, 119, *TAPPI Sect.*, *pp.* 123–126, *Sept.* 21, 1944.—New synthetic cation- and anion-active exchange resins (Ionac C–284 and Ionac A–293, respectively) and their performance in a 4-bed system comprising alternate layers of each, are described. Special reference is made to water treatment, including that of brackish water (dissolved salts reduced from 7 500 to 500 p.p.m.). A portable cartridge unit and a self-contained laboratory unit (capacity 30 gal./hr.) are described in detail. J. G.

541.132 1081

Ionization constants of butylamine, piperidine, and triethylamine in methanol. SCHAEFGEN, J. R., NEWMAN, M. S., AND VERHOEK, F. H. *J. Amer. Chem. Soc.*, 66, *pp.* 1847–1849, *Nov.*, 1944—The concentration and thermodynamic ionization constants were determined at room temperature, using bromcresol purple as indicator. W. R. A.

541.132 : 532.77 : 532.713 *see Abstr.* 879

541.132 : 536.423.15 : 532.713 *see Abstr.* 880

541.132 : 536.7 1082

Ionization constant of boric acid and the *p*H of certain borax-chloride buffer solutions from 0° to 60°C. MANOV, G. G., DELOLLIS, N. J., AND ACREE, S. F. *J. Res. Nat Bur. Stand., Wash.*, 33, *pp.* 287–306, *Oct.*, 1944.—The ionization const. of H_3BO_3 was determined by the use of the e.m.f. of cells without liquid junctions. H and Ag–AgCl electrodes were immersed in borax–NaCl solutions. The e.m.f. were measured at 5 deg. intervals from 0° to 60°C. The neg. common log. of the ionization const. may be represented by $2\,237{\cdot}94/T + 0{\cdot}016883T - 3{\cdot}305$, where T is the abs. temperature. The mean activity coefficients of the ions of NaCl and of $Na_2B_4O_7$ do not differ appreciably. A discussion is given of the significance of the quantity a_i (distance of closest approach of the ions) and its importance in the calculation of *p*H values. The changes in free energy, heat content, entropy, and heat capacity that accompany the ionization of 1 mole of H_3BO_3 are listed.

541.132 : 541.123.59 1083

Cation exchange at high *p*H. NELSON, R., AND WALTON, H. F. *J. Phys. Chem.*, 48, *pp.* 406–410, *Nov.*, 1944.—In H_2SO_4-treated coal there are many acidic groups having a low dissociation const., since at *p*H 10 to 12 the cation-exchange capacity is about twice as great as in weakly acid or neutral solutions. This extra exchange capacity can be utilized with heavy metals if these form NH_3 complexes. A practical process to recover or separate such metals at high *p*H might be worked out if the NH_3 used to form and stabilize the complex ions could be recovered.

541.132 : 541.134 *see Abstr.* 1092

541.132 : 541.452 1084

The behaviour of sulphur dioxide as an acid in methanol. GUSS, L. S., AND KOLTHOFF, I. M. *J. Amer. Chem. Soc.*, 66, *pp.* 1484–1488, *Sept.*, 1944.—The conventional dissociation const. of SO_2 in methanol was determined by colorimetric and conductimetric methods. The acidity is due to the monobasic acid, $CH_3O{-}SO_2H$. The addition of small quantities of water to methanol solutions of SO_2 results in the transfer of protons from methanol to water, without affecting other equilibria.

541.132 : 663.63 : 679.5 1085

Demineralizing of water for the pulp and paper industries. NORDELL, E. *Paper Tr. J.*, 119, *TAPPI Sect.*, *pp.* 141–144, *Oct.* 5, 1944.—The use of organic cation and anion, zeolite-type exchangers (Zeo-Carb, and the aliphatic amine resin, De-Acidite, respectively) is described. Efficiency of removal of mineral constituents in this way compares favourably with distillation, and operating costs are considerably less. SiO_2 is not removed by this method, and should be separated by preliminary treatment by known methods. Applications include the manufacture of plastics and of paper for dielectrics and other purposes for which low hardness, Cl' and SO_4'' contents are necessary; and in the treatment of boiler feedwater. J. G.

541.132 : 679.5 1086

Resinous ion exchange applications. MUELLER, E. R. *Paper Tr. J.*, 119, *TAPPI Sect.*, *pp.* 120–123, *Sept.* 21, 1944.—The principles of the operation of ion-exchange-type synthetic resins are described. The equivalent in quality of U.S.P. once-distilled water is obtainable commercially at a low cost, and removal of 98% of the inorganic salts from sugar juices has been achieved in this way; a modified form of the process has enabled acidic constituents to be recovered from waste materials. J. G.

541.132.3 1087

Observations on the rare earths. LI. MOELLER, T., AND KREMERS, H. E. *J. Phys. Chem.*, 48, *pp.* 395–406, *Nov.*, 1944.—Electrometric titration data for nitrate, sulphate, and acetate solutions of 12 of the rare-earth elements, including Y, indicate decreases in the basicities of the hydrous oxides or hydroxides with parallel decreases in the radii of the trivalent cations. The basicity of Y hydroxide is between those of Gd and Er hydroxides, in accordance with size relationships. Calculation of the solubility-product constants and water solubilities was carried out on the assumption that all precipitates are hydrous hydroxides. A numerical evaluation of relative basicities based upon solubility-product constants is given.

541.133 1088

The conductance of solutions of magnesium perchlorate in *n*- and *iso*-propyl alcohols. VAN RYSSELBERGHE, P., AND HUNT, G. J. *J. Amer. Chem. Soc.*, 66, *pp.* 1488–1489, *Sept.*, 1944.—The conductances of solutions of $Mg(ClO_4)_2$ in $Pr^{\alpha}OH$ and $Pr^{\beta}OH$ were measured from 0·0002 to 1·2*N* at 25°. The conductances in $Pr^{\gamma}OH$ are approx. twice those in $Pr^{\beta}OH$; this is attributed to differences in the structures of the solvated ions in the two solvents. W. R. A.

541.133.08 1089

The conductivity of sulphuric acid in methanol at 20°, 30°, and 35°. KANNING, E. W., BYRNE, J. B., AND BOBALEK, E. G. *J. Amer. Chem. Soc.*, 66, *pp.* 1700–1703, *Oct.*, 1944.—Conductance data at 20°, 30° and 35° confirm earlier conclusions [Abstr. 2421 (1943)] that H_2SO_4 in MeOH exhibits the properties of a strong univalent electrolyte. W. R. A.

541.133.1 1090

Polarographic behaviour of alkaline earth metals. I. Barium and strontium. ZLOTOWSKI, I., AND KOLTHOFF, I. M. *J. Amer. Chem. Soc.*, 66, *pp.* 1431–1435, *Sept.*, 1944.—The half-wave potentials of Ba and Sr in H_2O are $-1{\cdot}94$ and $-2{\cdot}11$ V. Diffusion current constants and diffusion coefficients for Ba and Sr in H_2O and in H_2O–EtOH mixtures are given. In H_2O–EtOH mixtures the values of the diffusion coefficients decrease with the increase in EtOH and reach a min. at 80 vol. % EtOH. [See Abstr. 2695 (1942)]. W. R. A.

541.133.1 : 541.135.5 1091

Fundamental studies with the dropping mercury electrode. III. Influence of capillary characteristics on the diffusion current and residual current. LINGANE, J. J., AND LOVERIDGE, B. A. *J. Amer. Chem. Soc.*, 66, *pp.* 1425–1431, *Sept.*, 1944.—The diffusion current const. of Pb ion in *N* KCl was investigated over a considerable range of times of drop and rates of flow of Hg, and with a variety of capillaries. The observed value of the diffusion current is independent of the relative galvanometer period when the ratio of the half-period to drop time is varied from 1 to 4. The residual current is related to the capillary characteristics by an equation which is in accord with experimental data. The rate of Hg flow from the dropping Hg electrode in *N* KCl is $<$ in air; the difference is inversely $\propto$ the pressure on the dropping electrode and depends on the characteristics of the capillary. W. R. A.

541.134 : 541.132 1092

Liquid-junction potentials, and relative activity coefficients of chloride ions, in concentrated mixed chlorides and nitrates at 25°C. MANOV, G. G., DELOLLIS, N. J., AND ACREE, S. F. *J. Res. Nat. Bur. Stand., Wash.*, 33, *pp.* 273–286, *Oct.*, 1944.—Measurements are reported of the e.m.f. at 25°C. of pairs of calomel half-cells in which portions of the saturated KCl had been replaced at const. ionic strength (4·831) by HCl and KNO_3. The method of cells with liquid junctions was used. Data are given for the stability of half-cells prepared with these electrolytes, for the reproducibility of the liquid junction and the calculated value of its potential, and for the activity coefficient of the chloride ion relative to that of saturated KCl solution. The addition of HCl raises and the addition of KNO_3 lowers the mean activity coefficient of chloride ion.

541.134 : 667.21 1093

Porphyrexide and porphyrindine analogues derived from 1-hydroxyaminocyclohexyl cyanide. PORTER, C. C., AND HELLERMAN, L. *J. Amer. Chem. Soc.*, 66, *pp.* 1652–1655, *Oct.*, 1944.—Determinations of the oxidation-reduction potentials of the new dyes indicated that the values, E_0', for the half-reduced systems B : A and D : C at *p*H 7 and 18° are 0·690 and 0·534 V, i.e. 0·035 and 0·02 V negative to the respective porphyrexide and porphyrindine systems.

541.135.5 : 541.133.1 *see Abstr.* 1091

541.138 1094

Electrochemical studies on vanadium salts. I. The vanadyl-vanadic oxidation-reduction potential. JONES, G., AND COLVIN, J. H. **II. The hydrolysis of vanadyl sulphate and vanadic sulphate solutions.** JONES, G., AND RAY, W. A. **III. The vanadic-vanadous oxidation-reduction potential.** JONES, G., AND COLVIN, J. H. *J. Amer. Chem. Soc.*, 66, *pp.* 1563–1579, *Sept.*, 1944.—Values of ${}_HE_0^V$ at 0° and 25° are derived as $-0{\cdot}36_1$ and $-0{\cdot}33_7$ V, and corresponding values of the equilibrium const. for the reaction $V^{+++} + H_2O = VO^{++} + 2H + \frac{1}{2}H_2$ are $0{\cdot}21_9$ and $1{\cdot}9_8 \times 10^{-6}$. The values are obtained by combining the data from measurements on cells of the type Pt, $VOSO_4$ + $\frac{1}{2}V_2(SO_4)_3 + H_2SO_4$; H_2SO_4, Hg_2SO_4, Hg, with those of Harned and Hamer [Abstr. 1822 (1935)] on cells of the type $\bar{\text{Pt}}$, H_2, H_2SO_4, Hg_2SO_4, Hg. *p*H measurements have been used to show that aq. $VOSO_4$ and $V_2(SO_4)_3$ at 25° are hydrolysed and are, therefore, acid. By combining the data from potential measurements at 0° and 25° on cells of the type $\bar{\text{Pt}}$, $\frac{1}{2}V_2(SO_4)_3 + VSO_4 + H_2SO_4$, H_2SO_4, Hg_2SO_4, Hg with those of Harned and Hamer (see above), values for the standard potential of the cell dependent on the reaction $V^{++} + H^+ = V^{+++} + \frac{1}{2}H_2$ are derived as $+0{\cdot}25_5$ V at 25° and $+0{\cdot}26_5$ V at 0°. The values of the equilibrium constants at 0° and 25° are $1{\cdot}3$ and $4{\cdot}8 \times 10^{-5}$. W. R. A.

541.138.3 1095

The kinetics of the electroreduction of acetone. HENNIG, G. R., AND KIMBALL, G. E. *J. Chem. Phys.*, 12, *pp.* 415–423, *Oct.*, 1944.—The reduction rate was studied at various acetone conc. in varying conc. of NaOH in solutions of Na_2SO_4, NaCl, $Ba(OH)_2$, and KOH. At low acetone conc. the rate of formation of isopropyl alcohol is $\propto$ the acetone conc., while the rate of formation of pinacol is $\propto$ (acetone conc.)^2. At higher acetone conc. the pinacol rate becomes linear in acetone conc. and near saturation the isopropyl alcohol rate becomes practically independent of acetone conc. At const. c.d., increasing the NaOH conc. decreases the yield of isopropyl alcohol and increases the yield of pinacol (except at high conc. of acetone and NaOH). Substitution of chloride or sulphate for hydroxide causes an increase in the alcohol rate but lowers the pinacol rate. Substitution of Ba for Na stops the reduction completely. Substitution of K for Na increases both yields. Increasing the c.d. is accompanied by a decrease in the fraction of the current which goes into isopropyl alcohol formation and pinacol formation.

541.144.7 : 539.155.2 1096

Isotopic composition of photosynthetic oxygen. DOLE, M., AND JENKS, G. *Science*, 100, *p.* 409, *Nov.* 3, 1944.

541.144.8 1097

Photolysis of the *d*-glycosides: α benzylfructofuranoside, β benzylfructopyranoside, and α and β phenyl, benzyl, and β phenylethylglucosides; and the bearing of the data on the transfer of energy within molecules. HEIDT, L. J. *J. Franklin Inst.*, 234, *pp.* 473–485, *Nov.*, 1942.—Direct absorption of light by glycosides dissolved in water was found to produce changes in optical activities and formation of material which reduces the Shaffer, Hartmann and Somogyi reagent. Comparison of these measurements indicates in many cases the same products as are formed

by hydrolysis in acid. The β glucosides and α fructoside, however, apparently give optically inactive photolytic products. Absorption spectra for the α and β benzylfructo compounds were found to be the same in the near ultraviolet as those previously obtained for benzyl glucosides and benzyl alcohol. The absorption spectrum for fresh fructose gives a deeper min. at λ 240 mμ than previously reported. The latter were approached by crystals which had stood in air for several months. Less than 5% of the ultra-violet light of λ 254 mμ absorbed by the glycosides produces reaction. The absorption spectra, the products of photolysis, and the quantum yields lead to the view that the photochemical reaction is produced by an intramol. transfer of absorbed energy from the aglycone to the hemiacetal oxygen bridge, which is the reactive centre. N. M. B.

541.144.8 1098

The influence of inert gases on the photodecomposition of gaseous acetone. IREDALE, T., AND LYONS, L. E. *J. Chem. Soc., pp.* 588–590, *Nov.*, 1944.—CO_2 and N_2 were used at pressures near to atmospheric at room temperatures in light of 2 400–3 100 Å. The yield of CO was increased, no detectable amounts of diacetyl were formed, and the ratio C_2H_6/CO approached unity.

541.145 1099

The photochemical inactivation of trypsin and papain solutions in the ultra-violet region. KAUFFMAN, F. L., AND URBAIN, W. M. *J. Amer. Chem. Soc.*, 66, *pp.* 1250–1253, *Aug.*, 1944—Quantitative data are given for dilute solutions using the following ultra-violet light sources: 360 W Uniarc (h.p. Hg arc in quartz) emitting radiations down to 1 850 Å; the same with a H.R. Clear Corex D 970 filter to raise the lower limit of the radiations to between 2 800 and 2 900 Å; and a 20 W Sterilamp with the bulk of the radiations at 2 537 Å. The energies emitted in the utra-violet range are 521, 264 and 28·2 μW/cm.^{2} at 1 m. respectively. The energy required to inactivate a papain solution depends on the wavelength and intensity of the light and the angle at which it strikes the solution. W. R. A.

541.18.043 1100

Direct centrifugation onto electron microscope specimen films. CRANE, H. R. *Rev. Sci. Instrum.*, 15, *p.* 253, *Oct.*, 1944.

541.18.043 : 539.215.5 1101

Particle-size distributions by centrifugal sedimentation. BROWN, C. *J. Phys. Chem.*, 48, *pp.* 246–258, *Sept.*, 1944.—An analysis is made of the sedimentation of particles from a suspension by a beaker-type centrifuge. The weight fraction of particles with diameters $< D_m$, $\int_0^{D_m} F(D)dD$, may be calculated from the equation:

$$\frac{R^2 - S^2}{2S}\frac{\partial p}{\partial S} + (1 - p) = \int_0^{D_m} F(D)dD$$

where R and S are the distances of the bottom and top, respectively, of the suspension from axis of rotation, and p is the weight fraction sedimented in flat sector-shaped tubes. D_m is the dia. of the smallest particles 100% sedimented. Formulae are derived for the particle-size distribution function in terms of $\partial p/\partial S$ and $\partial^2 p/\partial S^2$ or in terms of $\partial p/\partial t$ and $\partial^2 p/\partial S \partial t$. Approximations introduced by the use of cylindrical centrifuge tubes and the assumption of vibration-free centrifuging are discussed. If cylindrical tubes are used, the sedimentation equations become identical in form with those for gravitational sedimentation. Particle-size analysis of alcohol suspensions of $BaCO_3$ and of $SrCO_3$ from sedimentation data in cylindrical tubes filled to a series of levels illustrates the method.

541.182 : 532.694.1 *see Abstr.* 876

541.182 ≐ 3 1102

Results of aerosol research in science and engineering. 1932–1942. I. MEYER, K. A. G. *Kolloidzschr.*, 102, *pp.* 293–298, *March*, 1943.—A progress review of scientific research on aerosols, with an extensive bibliography. R. N.

541.182 : 667.3 = 3 1103

Development in printing with pigments. HASSE, G. *Melliand Textilber.*, 24, *pp.* 277–280, *June*, 1943.—Existing processes are reviewed, with special reference to organic lake pigments. In a recent method the water-insoluble binding agent is dissolved in the solvent, and then emulsified with water; the resulting emulsion is used as a suspending medium for the pigment. Drying and fixation take place by contact with a cylinder at 130–150° for 1–3 min. The technique, standardization and applications of the method are described. The resistance to washing of prints on "zellwolle" is less than on cotton. The alkalinity of the water used for washing pigment-printed textiles should not be too high, because some binders are thereby weakened. J. G.

541.182.5 1104

Size distribution in gelatin solutions. Preliminary report. SCATCHARD, G., ONCLEY, J. L., WILLIAMS, J. W., AND BROWN, A. *J. Amer. Chem. Soc.* 66, *pp.* 1980–1981, *Nov.*, 1944.

541.182.6 : 532.133 1105

The state of dispersion of calcium stearate in mineral oils. GALLAY, W., AND PUDDINGTON, I. E. *Canad. J. Res. B*, 22, *pp.* 161–172, *Nov.*, 1944.—Ca stearate undergoes a partial melting to a mesomorphic state at about 100°C., as shown by discontinuities in the density/temperature relation and in differential cooling measurements, and by the onset of plasticity. No surface activity is exhibited by the soap in mineral oil, even in the mesomorphic state. Ca stearate dispersions in a non-polar mineral oil are essentially lyophobic up to 180°C., whereas the soap is dispersed to a sol in more polar oils at a temperature slightly above the partial melting point. The viscosity of these dispersions, measured over a range of temperatures in a variable-pressure efflux viscosimeter shows unusual characteristics. A max. viscosity at intermediate temperatures was found, accompanied by a high degree of dilatancy. The presence of water lowers the viscosity and destroys dilatancy by agglomeration of the dispersed soap.

541.182.6 : 532.133 *see Abstr.* 862

541.182.6 : 532.785 : 535.515 1106

The recrystallization of calcium soaps in mineral oils. GALLAY, W., AND PUDDINGTON, I. E. *Canad. J.*

Res. B, 22, *pp.* 173–181, *Nov.*, 1944.—The effect of various factors on the stability and physical properties of suspensions of recrystallized Ca stearate is shown. Non-polar oils form lyophobic systems that are unstable. Polar oils yield suspensions that are stable and lyophilic in character with little or no rigidity. The effect of small quantities of water is very marked. As a result of agglomeration, a structure is developed, and the system shows a strong stream double refraction. Lower alcohols have a similar effect. Fatty acid brings about agglomeration also but increasing quantities produce a solvent effect. Ca oleate behaves similarly to Ca stearate.

541.182.6:532.64 *see Abstr.* 872

541.182.6 : 667.21 = 3 1107

On special methods of dyeing with indanthrene colours. GUND, F. *Melliand Textilber.*, 24, *pp.* 435–437, 470–474, 1943.—In the principal process described, the indanthrene dyestuff is produced in the form of a suspension (particle size 0·01–0·18 μ). It is used with an equalizing agent, a heat-stabilizing agent and tannin, at 85°–90°C. for 30 min., after which NaOH is added as required, followed by $Na_2S_2O_4$. A modified process may be used for indigoid dyestuffs, but the presence of a sulphonated oil is then desirable. Regenerated cellulose fibres show much stronger swelling than cotton fibres after the above treatment, especially in presence of NaOH and at a low temperature. J. G.

541.182.6.04 1108

Rate of sedimentation. Suspensions of uniform-size angular particles. STEINOUR, H. H. *Industr. Engng Chem.*, 36, *pp.* 840–847, *Sept.*, 1944.—[See Abstr. 2298 (1944)]. Except for the value of an experimental constant, one rate equation applies to both flocculated and nonflocculated states, provided the flocculated suspensions are highly concentrated. A portion of the liquid suspension medium is carried down with the angular emery particles during their fall, whether the suspensions are flocculated or not. The question whether this liquid is bound to the particles or simply stagnant is studied; evidence supports the latter view.

541.182.6.04 1109

Rate of sedimentation. Concentrated flocculated suspensions of powders. STEINOUR, H. H. *Industr. Engng Chem.*, 36, *pp.* 901–910, *Oct.*, 1944.—Most of the solids were tested at more than one fineness. Each powder embraced a wide range of particle sizes and was tested at a series of concentrations. The rate equation [Abstr. 1108 (1945)] is supported by the new data.

541.182.6.046 = 3 1110

The ion exchange with colloidal sulphur. II. Contribution to the knowledge of the ion exchange of lyophobe colloidal systems. VERSTRAETE, E. O. K. *Kolloidzschr.*, 103, *pp.* 25–42, *April*, 1943.—[See Abstr. 2299 (1944)]. The ion exchange between H^+ and 1-, 2-, 3-, 4- and 6-valent cations was quantitatively investigated by determining the acid equivalents of the sol and of the ultrafiltrate before and after the addition of the foreign electrolyte. The difference between the 2 values gives the acid equivalent of the micelle. The H-ions replaced in the double layer by other cations pass into the dispersion medium and a corresponding quantity is found in the ultrafiltrate. The ion exchange does not usually run parallel with the addition of electrolyte. The cations of different valencies are arranged in the order of their exchangeability (e.g. K > Na > Li; Ba > Sr > Ca > Mg). Measurements of *p*H were made after total coagulation with the different electrolytes. The antagonism between H^+ and Na^+ on the one hand and the different cations on the other was investigated. R. N.

541.182.6.058 1111

Preparation and purification of hydrous oxide sols by ion exchangers. RYZNAR, J. W. *Industr. Engng Chem.*, 36, *pp.* 821–823, *Sept.*, 1944.

541.182.6.058 : 677.3 = 3 1112

Isolation and properties of the fusiform cells of wool. ELÖD, E., AND ZAHN, H. *Melliand Textilber.*, 24, *pp.* 245–249, *June*, 1943.—The following method of isolation results in a max. yield with min. mechanical damage to the cells. The washed disintegrated wool is digested in 0·5% filtered, pancreatin–PS solution containing 1% of a borax buffer (*p*H 8·6) at 45° for 5 hr. The residue is washed, and rubbed gently with water in an unglazed porcelain mortar; the resulting milky liquid contains the cells in suspension. The microscopical and chemical properties of the cells are described. The latter, cystine contents, and the rates of decomposition are, in general, approx. the same for the cells as for the original wool. Both absorb the same amounts of certain dyes, but the former does so more rapidly in the early stages. J. G.

541.183 1113

The retention of fluids by solids. NUTTING, P. G. *J. Franklin Inst.*, 238, *pp.* 177–184, *Sept.*, 1944.—A general mathematical relation between energy of retention, pressure and temperature is developed by thermodynamic methods, applicable even to cases where that energy varies with the amount of fluid present. The three classes of experimental absorption data: heat of wetting, change of wt. with temperature, and change of wt. with v.p., are reviewed, their interpretation in the light of thermodynamic theory is discussed, and relations between energy of change of phase and amount of fluid retained are deduced. Research necessary to clear up the whole field of fluid retention by solids from pure liquid to pure solid is indicated. N. M. B.

541.183.24 1114

The combination of fibrous proteins with acids. II. The adsorption of dye anions. GILBERT, G. A. *Proc. Roy. Soc. A*, 183, *pp.* 167–181, *Nov.* 30, 1944.—Equations developed previously [Abstr. 2472 (1944)] accord with extant data for the adsorption of dyes in the presence of salt. The contribution of particular groups in the dye molecules to the free energy of adsorption is determined, and the influence of the valency of the dye ion is related to the potential on the protein fibre. The effect of temperature on the ionic equilibria is calculated, and estimated experimentally for a simple dye using a rapid "null" method for the attainment of equilibrium.

541.183.5 1115

Dehydration of commercial gases by solid adsorbents. CAPPELL, R. G., HAMMERSCHMIDT, E. G., AND DESCHNER, W. W. *Industr. Engng Chem.*, 36, *pp.* 779–784, *Sept.*, 1944.—Operating and laboratory

data are given on the solid adsorption dehydration of commercial gases. The loss in adsorptive capacity of several adsorbents is given as a function of time or number of reactivations. Laboratory data on accelerated fouling of adsorbents show the effects of reactivation atmospheres on the decline in adsorptive capacity. The pressure loss for gases flowing through beds of commercial adsorbents is presented and also a method for estimating the quantity of reactivation gas required for reactivating solid adsorbent beds.

N. M. B.

541.183.5 1116

Adsorption phenomenon of beta-carotene. BAUERNFEIND, J. C., BAUMGARTEN, W., AND BORUFF, C. S. *Science*, 100, *pp.* 316–317, *Oct.* 6, 1944.

541.183.5 1117

Adsorption of solvent vapours on commercial activated carbon. SAWYER, F. G., AND OTHMER, D. F. *Industr. Engng Chem.*, 36, *pp.* 894–900, *Oct.*, 1944.—The equilibria of pressures, temperatures, and concentrations on a commercial activated carbon were determined for acetone, methyl ethyl ketone, methyl isobutyl ketone, methanol, carbon disulphide, and ethyl ether. Improved apparatus is described. The weight of vapour adsorbed is measured by observing with a microscope the elongation of a sensitive Be-Cu spring carrying the adsorbent. The data are plotted initially as isotherms; from these the isosteres are cross-plotted to give straight-line relations. Heats of adsorption are calculated by the same method.

541.183.5 : 532.696 : 536.658 : 531.724 1118

Surfaces of solids. XI. Determination of the decrease (π) of free surface energy of a solid by an adsorbed film. JURA, G., AND HARKINS, W. D. **XII. An absolute method for the determination of the area of a finely divided crystalline solid. XIII. A vapour adsorption method for the determination of the area of a solid without the assumption of a molecular area, and the areas occupied by nitrogen and other molecules on the surface of a solid.** HARKINS, W. D. AND JURA, G. *J. Amer. Chem. Soc.*, 66, *pp.* 1356–1373, *Aug.*, 1944.—The decrease (π) of the free-surface energy of the surface of a solid caused by the presence of a film adsorbed from a vapour can be obtained by integrating the isotherm, provided adequate data are available on the pressure of the vapour and the amount of vapour adsorbed. Data are given for π as a function of the relative pressure of the adsorbed vapours for N_2 (at $-195{\cdot}6°$), H_2O (25°), n-C_7H_{16} (25°), and n-C_4H_{10} (0°) on TiO_2 (anatase). The spreading coefficient, free energy of emersion, and work of adhesion of N_2, H_2O, n-C_4H_{10} and n-C_7H_{16} on anatase are given. For N_2 at $-195{\cdot}8°$ the film pressure of the monolayer varies from 20·6 to 29·8 ergs per sq. cm. when the relative vapour pressure is varied from 0·114 to 0·081. The area of a solid covered with a film in equilibrium with the vapour of liquid at the saturation pressure of the liquid is given by dividing $4{\cdot}185 \times 10^7$ times the heat of emersion by the total energy of the surface of the liquid, if the contact angle is zero. A relationship is given for the area of a non-porous solid in terms of the area of the saturated powder. The surface area of a solid is calculated by plotting $\log p$ (or better, $\log p/p_0$) against $1/v^2$. Values agree well with those obtained using the methods, but not the assumption, of Brunauer, Emmett, and Teller [Abstr. 1479 (1938)]. W. R. A.

541.183.5 : 536.658 1119

Adsorption of water vapour by proteins. BULL, H. B. *J. Amer. Chem. Soc.*, 66, *pp.* 1499–1507, *Sept.*, 1944.—The weight of H_2O vapour adsorbed by 18 different proteins was studied as a function of the aq. v.p. at 25° and 40°, and the free-energy changes and the heat changes of adsorption are calculated. The multilayer adsorption theory [Abstr. 1479 (1938)] satisfactorily describes what occurs. In the solid state, the proteins are linked together to form coherent planes, the exposed surfaces of which are hydrophilic. H_2O is adsorbed between these planes.

W. R. A.

541.183.56 : 536.658 1120

The adsorption of hydrogen on tungsten. I–II. FRANKENBURG, W. G. *J. Amer. Chem. Soc.*, 66, *pp.* 1827–1847, *Nov.*, 1944.—The adsorption of H_2 on W was measured for equilibrium pressures from 1×10^{-5} to 30 mm. and between $-194°$ and 750°. The W powder adsorbents had surfaces of from 7 000 to 20 000 cm.^{2}/g. and, previous to adsorption, were reduced in a stream of H_2 at 750° and outgassed by heating in vacuum at 750° for 35–50 hr. The adsorption is characterized by a large uptake of H_2, particularly at l.p., but the amounts adsorbed at the same equilibrium pressure differ widely for different temperatures, particularly in the l.p. range. Extrapolation of the adsorption isotherms to h.p. gives a saturation value corresponding to the covering of 2 W atoms in the surface by 1 molecule of H_2. The amounts of H_2 adsorbed per cm.^{2} of W surface are the same for 2 different powders (at the same temperature and pressure), the surfaces of which differ by the factor 3. When $\log A$ (amount adsorbed) is plotted against $\log p$ (equilibrium pressure), the isotherms are nearly straight lines with slopes ranging from 1·75 (750°) to 78·0 ($-194°$). Log. isotherms converge fanwise towards a point of intersection at h.p. Isotherms plotted for a powder of high specific surface at high temperatures and coverings of W of $< 0{\cdot}8\%$ of the saturation value, all have the same slope. The differential heats of adsorption are evaluated. At $< 0{\cdot}8\%$ saturation covering, the value is independent of the amount adsorbed within the range $-194°$ to 530° ($\sim$ 46 000 g.cal./mol of H_2), but at higher coverings the value decreases rapidly with increasing covering. The agreement with the data of Roberts (*Proc. Roy. Soc.*, 1937, *A*, 161, 141) suggests that the surfaces of outgassed powders consist essentially of free metal. A theoretical derivation of the measured adsorption equilibria can be based on the Langmuir isotherm modified to take account of the changes in the differential heat of adsorption with covering of the surface. From a discussion of the slopes of the isotherms in conjunction with the Langmuir formula, it is concluded that the saturation covering is 1 mol of H_2 per 2 atoms of W and that at $< 0{\cdot}8\%$ saturation hydrogen exists on the surface as atoms whilst at $> 0{\cdot}8\%$ it exists as molecules. Suggested explanations of the changes of heats of adsorption with surface covering and with temperature are advanced. W. R. A.

41.24 : 532.133 *see Abstr.* 863

41.452 : 541.132 *see Abstr.* 1084

41.56 : 541.124.7 : 539.133 1121

Dissociation of methyl chloride on a hot filament. Doty, P. M. *J. Chem. Phys.*, 12, *pp.* 399–402, *Oct.*, 944.—An experimental method outlined for determining directly the bond energies in some polyatomic mols. depends on measuring the conc. of Cl and the ratio of Cl^- ions to electrons in the reaction $Cl + e \rightarrow Cl^-$ when Cl_2 mols decompose on hitting W wire at ~2 000°K. Experimental data obtained for the C–Cl bond in CH_3Cl are presented and discussed. The decomposition of CH_3Cl and CCl_4 on hot W is shown to be quite inefficient. N. M. B.

541.57 : 539.133 *see Abstr.* 1000

541.6 1122

Equilibrium distribution in sizes for linear polymer molecules. Tobolsky, A. V. *J. Chem. Phys.*, 12, *pp.* 402–404, *Oct.*, 1944.—Systems of linear polymer mols. form long chains, stable at low temperatures, while at sufficiently high temperature appreciable amounts of monomeric units split off. The definite equilibrium distribution in sizes existing at any given temperature is derived by statistical methods and is found to be a simple function of the heat of polymerization. N. M. B.

541.6 : 532.14 : 536.423.1 : 535.324 *see Abstr.* 899

541.62 : 541.121 1123

Butene-1 and butene-2 equilibrium. McCarthy, W. W., and Turkevich, J. *J. Chem. Phys.*, 12, *pp.* 405–408, *Oct.*, 1944.—The equilibrium between butene-1 and butene-2 was attained on activated alumina at 400° and 450°C. The values obtained agree with calculated results.

541.621 : 541.128.1 1124

The catalytic isomerization of paraffin hydrocarbons. II. Promoters for catalysis by aluminium bromide. III. The course of the reaction. Heldman, J. D. *J. Amer. Chem. Soc.*, 66, *pp.* 1786–1791, *Oct.*, 1944.—[See Abstr. 1416 (1944)]. Provided that precautions are taken to exclude H_2O and HBr, the Al_2Br_6-catalyzed isomerization of n-C_4H_{10} is promoted by NaBr, HCl, MeBr, $C_2H_2Br_2$, Bu^{t}Br, and BF_3. Al_2O_3 in presence of HBr increases the rate. The results are interpreted by postulating that tetrahedrally co-ordinated Al groups, such as AlX_4^- and $HAlX_4$, are the true catalysts for the isomerization. A mechanism for the Al halide-catalysed isomerization of paraffin hydrocarbons is developed, involving that the Al in AlX_4^- exhibits a co-ordination number >4 during catalysis and, consequently, that the Al in AlX_4^- is still acidic. It is predicted that MeBr and EtBr should alkylate paraffins in the presence of Al_2Br_6. W. R. A.

541.64 1125

The polymerization of cyclohexene with hydrogen fluoride. McElvain, S. M., and Langston, J. W. *J. Amer. Chem. Soc.*, 66, *pp.* 1759–1764, *Oct.*, 1944.—Cyclohexene adds HF at or below room temperature to yield cyclohexyl fluoride. In the absence of free HF, the cyclohexyl fluoride may be isolated. At 100°, cyclohexene and an equivalent of HF or cyclohexyl fluoride with catalytic amounts of hydrogen fluoride are converted into polymers of cyclohexene. Fluorohydrocarbons appear to be intermediates in this polymerization.

541.64 : 541.124 *see Abstr.* 1053, 1054

541.651 : 535.343 *see Abstr.* 906

542.48 1126

Improved reflux regulator and head for laboratory distilling columns. Willingham, C. B., and Rossini, F. D. *J. Res. Nat. Bur. Stand., Wash.*, 33, *pp.* 383–388, *Nov.*, 1944.

542.67 : 539.217.3 *see Abstr.* 1018

545.1 1127

Determination of tin in non-ferrous metals by distillation as bromide and precipitation with cupferron. Mogerman, W. D. *J. Res. Nat. Bur. Stand., Wash.*, 33, *pp.* 307–314, *Oct.*, 1944.—A gravimetric method is described for the determination of Sn in Cu-base and Pb-base alloys. The procedure involves separation of the Sn by distillation, precipitation with cupferron, and ignition to stannic oxide.

545.37 1128

A new method for the polarographic determination of nitrate. Kolthoff, I. M., Harris, W. E., and Matsuyama, G. *J. Amer. Chem. Soc.*, 66, *pp.* 1782–1786, *Oct.*, 1944.—In the presence of $UO_2^{\cdot}$ ions, NO_3' in dilute HCl is reduced at potentials where the second $UO_2^{\cdot}$ ion wave occurs. The well-defined diffusion current of NO_3' is $\propto [NO_3']$ when the ratio $UO_2^{\cdot}/NO_3'$ exceeds a certain min., and this ratio depends on the $[NO_3']$. The reduction of NO_3' under these conditions involves 5 electrons and indicates that NO_3' is reduced to N_2. Quantitative determination of very dilute solutions of NO_3' is possible. In a solution 0·01 *M* in HCl and 0·1 *M* in KCl, the half-wave potential is approx. 0·9–1·0 V with respect to the standard calomel electrode. The advantages of this method over the existing method involving excess of $LaCl_3$ are discussed. Uranous salts may be used instead of uranyl. W. R. A.

545.37 1129

Polarographic reduction of carbon dioxide. van Rysselberghe, P., and Alkire, G. J. *J. Amer. Chem. Soc.*, 66, *p.* 1801, *Oct.*, 1944.—With solutions of CO_2 in 0·1 *M* Me_4NCl, well-defined reduction waves with a half-wave potential of $-2{\cdot}24 \pm 0{\cdot}01$ V are obtained with respect to the standard calomel electrode. When H_2 has been bubbled through the solvent before dissolution of CO_2, the potential is $-2{\cdot}18 \pm 0{\cdot}02$ V. W. R. A.

545.81 1130

A method for the colorimetric determination of phosphorus. Sumner, J. B. *Science*, 100, *pp.* 413–414, *Nov.* 3, 1944.

548.0 : 549.211 : 536.41.01 *see Abstr.* 943

548.2 : 519.213 1131

Probability method applied to the analysis of recrystallization data. Dunn, C. G. *Phys. Rev.*, 66, *pp.* 215–220, *Oct.* 1 *and* 15, 1944.—Probability equations are developed for analysing recrystallization data to determine what mechanisms may operate during recrystallization processes. The equations allow for inexact variations in orientation changes provided the variations are small. $P(E) = 1{\cdot}43\alpha^3$ gives the probability that a nucleation will result in an

orientation falling within α radians of a specified one A on a chance basis. Other equations are given for the probability of occurrence of nearly common orientations for various types of groupings. Values of probabilities are given in tables.

548.73 1132

X-ray investigation of glycerides. I. Diffraction analyses of isomeric monoglycerides. FILER, L. J., JR., SIDHU, S. S., DAUBERT, B. F., AND LONGENECKER, H. E. *J. Amer. Chem. Soc.*, 66, *pp.* 1333–1337, *Aug.*, 1944.—Both short- and long-spacing diffraction data (characteristic for each compound) are given for isomeric pairs of monoglycerides, and these data are applied in identifying constituents of simple admixtures. An empirical equation is derived to express the long-spacing value in terms of the number of effective C atoms, and a direct relationship between the long spacings and the m.p. is established. The angle of tilt for 1-monoglycerides is > that for 2-monoglycerides. W. R. A.

548.73 1133

X-ray crystallographic studies of organic sulphonates. I. The quarter-hydrates of certain sodium 1-alkane-sulphonates. JENSEN, L. H., AND LINGAFELTER, E. C. *J. Amer. Chem. Soc.*, 66, *pp.* 1946–1947, *Nov.*, 1944.—Single crystals of $C_nH_{2n+1}SO_3Na$, $\frac{1}{4}H_2O$ ($n = 8$, 10, 12, 14, 16 and 18), grown from mixed solvents, have all the same habit, thin tabular parallel to {001} and elongated parallel to the a axis. Data were obtained from Laue, rotation, oscillation, and Sauter photographs and constants of the unit cells are given. The unit cell contains 8 molecules of $4RSO_3Na$, H_2O and the space group is probably C_{2h}^6. W. R. A.

549.1 : 621.791.745 1134

The identification of the constituents of welding-electrode coatings. VICKERY, R. C. *Metallurgia, Manchr, pp.* 119–123, *Jan.*, 1945.—[Abstr. 941 B (1945)].

549.211 : 548.0 : 536.41.01 *see Abstr.* 943

550.312 : 550.383 *see Abstr.* 1136

550.37 1135

Precise measurement of deep electrical anomalies. WEST, T. S., AND BEACHAM, C. C. *Geophysics*, 9, *pp.* 494–539, *Oct.*, 1944.—A method of electrical prospecting has been developed in which the deleterious effects of superficial inhomogeneities in resistivity are eliminated. An electrode configuration is used consisting of a current electrode at infinity, a pair of current electrodes with a const. separation of a few hundred ft. which are used alternately, and a pair of potential electrodes with a const. separation of a few hundred ft., collinear with the pair of current electrodes, and at a distance from them which is varied to secure depth resolution. Superficial influences are eliminated by forming the resistivity increment, the ratio between apparent resistivity determined by use of the closer current electrode of the alternate pair and that determined by use of the farther current electrode of the alternate pair. The area explored is below a point approx. half-way between the alternate pair of current electrodes. Resistivity-increment curves can be correlated from station to station, and after they are correlated, the lateral variation in the electrical properties of selected subsurface zones can be studied.

550.383 : 550.312 1136

Quantitative interpretation of magnetic and gravitational anomalies. KOGBETLIANTZ, E. G. *Geophysics*, 9, *pp.* 463–493, *Oct.*, 1944.—A new interpretation method for gravitational and magnetic anomalies based on the use of average values (integrals) of suitably chosen functions of the observed quantity is discussed and illustrated by application to the particular case of a symmetric anticline. The quantitative interpretation yields the position of the apex, the slope of the sides, the thickness, the depth of the base of the anticline, as well as the density contrast for the gravitational case and the magnitude and direction of the magnetization vector for the magnetic case.

550.384.3 : 552.52 : 538.214 : 621.317.44 1137

On the magnetic properties of varved clay. ISING, G. *Ark. Mat. Astr. Fys.*, 29*A*, 1, *No.* 5, 37 *pp.*, 1943.—It is suggested that varves containing ferromagnetic minerals should show anisotropic susceptibility, acquired during sedimentation in the Earth's magnetic field and thereafter unaffected by ageing. This anisotropy should thus be a better record of the secular variation of the Earth's field than the remanent moments, which may alter with time. A series of varves from S. Sweden is examined, and such anisotropy is found, the min. of susceptibility being in the vertical direction. Determination of the azimuth of max. susceptibility is however beyond present instrumental equipment. The direction of the remanent moment is nearly the same as that of the present field. The magnetic properties of the clay vary with distance of sedimentation from the ice border, and an annual period is found in the content of magnetic matter, the parts deposited in spring being several times more magnetic than those settling out in winter. The instruments used are described: they include an electromagnetic induction balance, a series of torsional magnetometers, a magnetic bridge and a pendulum magnetometer. A. HU.

550.43 1138

Analysis for hydrocarbons in the presence of nitrous oxide. KRIEGEL, M. W. *Geophysics*, 9, *pp.* 447–462, *Oct.*, 1944.—Field data on expansion ratios are presented to show that there exists in the soil air a gas, other than the saturated hydrocarbons, which is not removed by the screening agents and is retained in the condensation trap. The reasons for believing that this gas is N_2O are given, together with plausible sources of this gas in the soil air. Laboratory data are presented on the analysis of pure hydrocarbons in the presence and in the absence of this gas. Calculations made by each of the methods show that when results are based on after-burning readings, a true measure of the hydrocarbon content is evolved, regardless of the presence of N_2O.

550.831 : 550.834 1139

The geophysical history of the Cayuga Field, Anderson County, Texas. PEACOCK, H. B. *Geophysics*, 9, *pp.* 299–313, *July*, 1944.—Seismic maps of this area in the E. Texan Basin based on reflection seismograms and contoured on various horizons are given, together with a geological structure map. Cross-sections of the field are shown for comparison

etw. the seismic interpretation and the data from ells subsequently sunk. Results of a gravity-meter rvey are given and residual gravity values deduced removal of the regional effect. A. HU.

50.834 1140

How *not* to find an oil field. SLOAT, J. *Geophysics*, *pp.* 431–446, *Oct.*, 1944.—Discusses causes and ses of seismograph misinterpretation, with examples errors resulting from certain spreads, from weather- g computations, and from incorrect velocity sumptions. The question is raised whether sub- rranean weathering corrections, echo reflections, ansverse waves or regional velocity gradients have used serious mis-mapping of structure. The aluation of results from dip shooting is reviewed th cases showing how oil fields have been missed he psychological factor in picking records is stressed id the use of marked records in correlation is uestioned. The need for a better criterion of correla- on is expressed, and it is suggested that a more mplete study of results might result in fewer dry les.

50.834 1141

Index of wells shot for velocity. SWAN, B. G. *eophysics*, 9, *pp.* 540–559, *Oct.*, 1944.—This index ts 811 wells in which seismic velocity surveys have en made.

50.834 ; 550.831 *see Abstr.* 1139

51.509 : 621.311 1142

Meteorological service for electric power systems. DAVISON, A. E. *Elect. Engng, N.Y.*, 63, *pp.* 203–209, *ne*, 1944.—The meteorological needs of the electrical ower-supply, communications and traction services re indicated, and the wider dissemination and use f weather forecasts (esp. 4 to 12 hr. forecasts) are dvocated. Information is needed for operational se on the incidence, coverage, severity and paths and eeds, of all storm fronts and major disturbances, ith special attention paid to glazed frosts, electric nd magnetic storms, hurricanes and floods. A. HU.

51.511 = 6 1143

Comparison of thermodynamic diagrams of the tmosphere, mostly used in meteorology. DI CORLETO, . *Publ. Fac. Cienc. Fis.-Mat. La Plata*, 3, o. 39–75, *July*, 1944.—A general exposition tracing he development of graphical representation of thermo- ynamic phenomena of the atmosphere presents in he first place the diagrams of Hertz, Neuhoff, Creitmeyer and Bjerknes. The later treatment by tüve, Refsdal, Laijtman and Shaw are then presented n detail, together with a discussion of the relative erits in various applications, such as meteorological rvice, research, etc. R. M.

51.521.6 : 525.75 *see Abstr.* 833

51.556.4 1144

Meteorological investigations in Columbia River alley near Trail, B.C. HEWSON, E. W., AND GILL, . C. *Bull. U.S. Bur. Min., No.* 453, 206 *pp.*, 1944.— he relation betw. meteorological conditions in the alley and atmospheric diffusion processes is in- stigated so that damage to vegetation by SO_2 mission from smelting plant near Trail may be inimized. The general distribution of SO_2 in the alley is described, and from mean wind conditions, obtained by various means of observation, the transport of the gas in average circumstances is derived. The use of geostrophic winds for 6 hr. wind forecasts is discussed in detail. Diffusion of the gas, as distinct from wind transport, is governed by tur- bulence, and its relation to lapse rate and wind velocity is indicated. Full descriptions of the meteorological instruments used in the survey are given throughout. A. HU.

551.573 : 551.579.2 *see Abstr.* 1145

551.579.2 : 551.573 1145

Snow melting and evaporation. CROFT, A. R. *Science*, 100, *pp.* 169–170, *Aug.* 25, 1944.—The author reports on some studies of snow melting and evapora- tion made at about 10 000 ft. in central Utah during the spring of 1942. The effects on the rate of melting of air temperature, insolation, air movement and surface coloration, are described. At no time was the rate of melting so high as to cause surface run-off. Marked dependence of evaporation from the snow surface on atmospheric humidity, insolation and air movement, is found. A. HU.

551.579.5 1146

The sorption-block soil-moisture meter and hys- teresis effects related to its operation. RICHARDS, L. A., AND WEAVER, L. R. *J. Amer. Soc. Agron.*, 35, *pp.* 1002–1011, *Dec.*, 1943.—A porous ceramic block, if protected from evaporation, will come to moisture equilibrium with soil with which it is in contact. A description is given of a sorption-block soil-moisture meter based on weighing the block while suspended in the soil. Blocks saturated with water come to constant weight in wet soil in less than a day. Dry blocks come to const. weight in wet soil in less than 3 days, and wet blocks in dry soil in less than 5 days. Blocks transferred between adjoining moisture levels, either wetter or dryer, reach equi- librium within 2 days. The equilibrium weight of a given block in a given soil depends on whether the block was wet or dry initially; this hysteresis effect was largest in wet soil. Taking the variation in weight from saturation to wilting as a 100%, the block weight at equilibrium in wet soil varied through approx. 4% of this range. Data on the hysteresis effect for 6 soils are given. C. J. G.

551.593.63 1147

A solar halo phenomenon. ARCHENHOLD, G. H., SANSOM, G. S., DOCK, E. H., BLACKWELL, D. E., DE LA BERE, J. C. W., VAND, V., AND HOLDSWORTH, R. *Nature, Lond.*, 154, *pp.* 433–434, *Sept.* 30; 491, *Oct.* 14, *and p.* 517, *Oct.* 21, 1944.—A general dis- cussion on some meteorological-optical phenomena associated with artificial cirrus caused by aircraft vapour trails. Mock suns and portions of coloured and colourless halos are described. On one occasion several observers noted dark bands $^1/_5°$ wide and spaced $^1/_2°$ to 1° apart moving at 5° per sec. through the horizontal ring of a solar halo. This phenomenon is attributed to disturbance of the vertical orientation of the ice crystals by air currents or sound waves from distant explosions. Cloud caused by aircraft will be abnormally thin and will show such effects well. The observed angular velocity corresponds well with the speed of sound at ice-cloud levels and the band spacing gives a frequency of 2·5 to 5 c/s,

agreeing with the sound from heavy explosions. [See also Goldie, A. H. R., Savile, D. B. O., Cave, C. J. P., *ibid.*, pp. 738–739, Dec. 9, 1944]. A. HU.

551.594.221 : 537.523 1148

The initiation of long electrical discharges. BRUCE, C. E. R. *Proc. Roy. Soc. A*, 183, *pp.* 228–242, *Nov.* 30, 1944.—The glow-arc transition theory of the first leader stroke of a lightning flash is considered, and shown to be in accord with all the observations available, whereas the recombination theory is not considered to be. The greatly reduced potentials [Abstr. 958 (1942)] adequate to cause flashes, of the order of only 1% of those required in a homogeneous field, and the corona currents from the leader stroke channel, are confirmed by a discussion of the records of the currents in, and electrostatic field changes caused by, the first leader, which further indicates that formulae derived from laboratory studies of corona currents from wires and from pointed conductors can be extrapolated to lightning voltages, i.e. over a range of about 1 000 to 1.

552.52 : 538.214 : 621.317.44 : 550.384.3 *see Abstr.* 1137

553.621 : 535.376 : 539.169 *see Abstr.* 1004

553.621 : 621.39 : 681.2 1149

The mounting and fabrication of plated quartz crystal units. GREENIDGE, R. M. C. *Bell Syst. Tech. J.*, 23, *pp.* 234–259, *July*, 1944.—[Abstr. 998 B (1945)].

576.72 : 535.66 *see Abstr.* 926

576.8.095 : 539.169 *see Abstr.* 1005

576.8.095 : 541.128.5 *see Abstr.* 1077

581.036 = 4 1150

The ionic composition of vegetables and their culture temperatures. BACHRACH, E. *Arch. Sci. Phys. Nat.*, 26, *pp.* 87–100, *May–June*, 1944.—The author has shown [Abstr. 1911 (1944)] that, other things being equal, vertebrate animals which live in high-temperature climates are rich in the alkaline cation Na^+ and K^+, whilst those that exist at low temperatures are rich in the alkaline earths Ca^{++} and Mg^{++}, Na being the predominant cation. From an analysis of existing data it is now shown that in the vegetable kingdom it is K which is predominant. The ratio K/Na in the ashes of fruits of plants grown in lands with mean temperatures of 18°C. is about 16, but only 4·8 for those where the temperature is 12°C. There seems to be a similarity in the response of both animals and vegetables to the environmental temperature. Sugar content of plants also decreases, and it is suggested that sugar content and the cations may serve as thermo-regulators in the vegetable kingdom. R. W. P.

581.189.1 : 532.123 : 532.62 *see Abstr.* 870

591.111 : 535.343 = 6 *see Abstr.* 907

608.4 : 612.1 1151

A working model of the human circulation. D'AMOUR, F. E. *Science*, 100, *p.* 320, *Oct.* 6, 1944.

608.4 : 624.5 *see Abstr.* 1154

612.1 : 608.4 *see Abstr.* 1151

612.13 : 535.247.4 *see Abstr.* 895

612.84 1152

Absolute photopic sensitivity of the eye in the ultra-violet and in the visible spectrum. PINEGIN, N. I. *Nature, Lond.*, 154, *p.* 770, *Dec.* 16, 1944.

612.84 1153

Colour phenomena in ultra-violet vision. SCHNEIDER, E. E. *Nature, Lond.*, 155, *p.* 176, *Feb.* 10, 1945.

612.84 : 535.7 *see Abstr.* 932

623.8/.9 : 53 *see Abstr.* 834

624.13 : 539.214.9 *see Abstr.* 1008

624.13 : 539.32 = 3 *see Abstr.* 1029

624.19 : 539.214.9 *see Abstr.* 1009

624.5 : 608.4 1154

The use of models as a practical aid in the design of suspension bridges. WITMER, F. P. *J. Franklin Inst.*, 236, *pp.* 147–166, *Aug.*, 1943.—Models were made in order to verify stresses computed analytically, and also to determine whether stresses so obtained could be employed in actual design. Comparisons are made in the cases of 3 bridges, and the advantages of the model method are pointed out, as, for example, the same cable, stiffening girder and suspenders may be used for any case, suspender lengths being adjusted as required; the reassembly of the model for a new study may be made very quickly; and the position of live load for max. moment may be found quickly from the model. The details of the model and the method of procedure are described. G. E. A.

634.975 1155

Treatment of trees with chemicals to facilitate removal of bark. HALE, J. D. *Pulp Pap. Mag. Can.*, 45, *pp.* 615–618 *and* 620, *July*, 1944.—Chemicals in paste form were applied to freshly-exposed conifer sapwood during spring and early summer. The object was to kill the tree at this (the peeling) period, and so to fix the bark in such a condition that peeling long after the normal peeling period is facilitated. Chemicals which act rapidly, killing the leaves and reducing transpiration (white As + NaOH), were the most effective. Others ($CuSO_4$) were inconsistent in effect or less effective, the leaves being apparently unaffected almost until the normal period of leaf fall. Applications of the method to facilitate bark removal other than by freezing and soaking are indicated. J. G.

66.047 1156

Drying and dryers. CLEGG, R. R. *Paper Maker*, 108, *pp.* 5–8 *TS*, *July*; 25–40 *TS*, *Oct.*, *and pp.* 41–44 *TS*, *Nov.*, 1944.—The physical mechanisms of the removal of moisture in various forms are considered; the cases of surface moisture, hygroscopic or inherent moisture, water of crystallization, materials with fine-bore capillaries, and a liquid with a solid in solution or in suspension, are distinguished. Conduction diagrams, insulation, and heat exchange, and contact, hot air, tray, hanging, continuous, conveyor, rotary-drum, circulating-fan and cascade driers, are discussed. J. G.

661.713 1157

By-products of the cellulose industry. LASSENIUS, T. *Finnish Paper and Timber J.*, 26, *pp.* 73 *and* 85, 1944.—By-products dealt with include cymol, sulphite waste liquor products, alcohols (yielding solvents and rubber substitutes), yeast and sugars from the sulphite process; turpentine oil, tall oil, methanol and sulphur compounds from the sulphate process; and fatty and resin acids and solvents from black liquors. Yields are given. J. G.

1.713 1158

Some aspects of α-cellulose from wood. COSTER, W., AND VINCENT, R. *Paper Tr. J.*, 119, *TAPPI Sect.*, *pp.* 117–119, *Sept.* 21, 1944.—Analytical aspects e discussed. The results normally obtained do not able the effects of practical bleaching processes to followed closely, nor do they enable the practical lue of the pulp to be assessed accurately. Tabulated ta show how little relationship exists between the cellulose content, viscosity and the bursting strength developed on beating. The β- and γ-cellulose ntents provide useful information on the nature the α-fraction, and on the effect of bleaching on e pulp. J. G.

1.713 : 532.739.2 *see Abstr.* 884

3.63 : 679.5 : 541.132 *see Abstr.* 1085

6 : 539.217.1 *see Abstr.* 1016

6.11 : 539.216 *see Abstr.* 1010

7.11 1159

Effect of stepwise bleaching on the properties of lps. FORNI, P. A. *Paper Tr. J.*, 119, *TAPPI Sect.*, 108–112, *Sept.* 14, 1944.—Determinations of ysical and chemical properties made at different ges in the bleaching of pulp indicate that bleaching curs in 3 phases, corresponding with 0–20%, –80% and 80–110% of the bleach demand. The ysical properties of the pulp at each of these stages e described. J. G.

7.11 : 676.15 1160

Bleaching of mechanical pulps. Effect of varying the nditions in bleaching with sodium peroxide. EICHERT, J. S., CAMPBELL, D. J., AND SECORD, R. A. *ulp Pap. Mag. Can.*, 45, *pp.* 679–682, 1944.—Spruce ntaining 5% of balsam wood pulp was bleached th varying proportions of Na_2O_2 in presence of Na_2SiO_3 and H_2SO_4 at 32°C., and then neutralized d treated with $NaHSO_3$. The brightness obtained creased progressively with the consistency, between 7%, and with the peroxide content of the bleach th. From the economic standpoint, the best sults are obtained with 2% of peroxide acting for hr. Bleaching proceeds most rapidly in the early ges, and is dependent critically on the alkali con- nt. Accurate measurement of reagents and rapid d thorough mixing with the pulp are necessary. J. G.

7.11 : 676.15 1161

Sodium-peroxide bleaching of mechanical pulps. EICHERT, J. S., CAMPBELL, D. J., AND SECORD, R. A. *aper Tr. J.*, 119, *TAPPI Sect.*, *pp.* 157–159, *Oct.* 19, 944.—For the same amounts of Na_2O_2 the brightness lue (*B*) with pulp consistencies of 5–7% are greater an at 3%; 5% is adopted as a standard consistency. ne same *B* results whether the entire Na_2O_2 require- ent is used in one stage or in several consecutive naller additions. The increase in *B* per lb. of Na_2O_2 diminishes rapidly with increasing amounts of Na_2O_2; 2% of Na_2O_2 is the economic optimum. he max. *B* results after a bleaching time of approx. hr. The alkali conc. is a critical factor, and the ax. *B* occurs with that equiv. to 0·75% Na_2O_2, though the peak is not always a very sharp one. J. G.

7.11 : 677.21 : 539.216.1 *see Abstr.* 1012

7.13 : 539.216.1 *see Abstr.* 1013

667.16 = 3 1162

Enzymic splitting of starch and the evaluation of desizing materials. RATH, H., KEPPLER, D., AND ROESLING, I. *Melliand Textilber.*, 25, *pp.* 18–21, 58–64, *Feb.*, 1944.—The mechanism of the process is discussed, with special reference to the relative merits of pancreatic, bacterial and malt amylase preparations. All 3 are without effect on the degree of polymerization of the cellulose, and they all result first in rapid decreases in the viscosity of starch paste. The rate of disappearance of the I-starch colour decreases in the above order. Commercial preparations are not pure, and the effects of their constituents may be masked; e.g. by inhibition of activity, by adsorption of substrate, by the presence of certain metal ions (e.g. Cu, Zn, Hg, Co, Ni), or by residues on the fabric from washing, wetting and bleaching agents. Methods of control and analysis are described. J. G.

667.2 = 3 1163

The dyeing of spun yarn for cuprammonium and viscose rayons with direct dyes at low temperatures. SCHUMACHER, H. *Melliand Textilber.*, 24, *pp.* 231–233, *May*, *and pp.* 268–274, *June*, 1943.—The temperature of optimum dye absorption varies from one to another of the dyes in this group. A large number of these are classified into the grades: cold dyeing (40°–45°), hot dyeing (approx. 80°) and moderate heating dyeing. Conditions of dyeing other than temperature may in a few cases be adjusted so as to bring a dye from one class into another. Curves are shown relating time and the % of dye taken up at a low temp.; the time to attain fibre saturation is approx. the same for hot and cold dyeing, other conditions being equal. Uniformity of surface dyeing and dyestuff penetration are more difficult to attain at low temp. The economy in fuel with cold dyeing is considerable, and far more than offsets any technical disadvantages. J. G.

667.2 : 677.31 = 3 1164

On the fastness of oxyfisetin dyestuffs on wool. BRASS, K., AND NAUMANN, K. *Melliand Textilber.*, 24, *pp.* 434–435, 1943.—A 0·05% suspension of oxyfisetin (3.3′.4′.5′.tetrahydroxy flavanol) in dilute AcOH was used in an Al_2O_3 lake, an acid $ZnCl_2$ bath and a hot Cr dyebath for wool. Fastness values obtained were, respectively: light, 1, 1, 2–3; alkali, 1, 1, 3; steam pressing, 3, 3, 3; perspiration, 3, 3, 5; rubbing, 4, 2, 3–4; ironing, 3, 2–3, 2–3; sulphur, 1, 3, 3; water, 3–4, 4–5, 5. J. G.

667.21 : 535.66 *see Abstr.* 927

667.21 : 541.134 *see Abstr.* 1093

667.21 : 541.182.6 = 3 *see Abstr.* 1107

667.22 = 3 1165

Dyeing "zellwolle" with sulphur dyes at low temperatures. KÖSTER, E. *Melliand Textilber.*, 24, *pp.* 265–266, *June*, 1943—Many dyes of the Immedial type may be used satisfactorily with "zellwolle" at 50°. The reducing agent for vatting is an alkaline hydrosulphite; in 1 hr. the depth of shade is approx. equal to that obtained at 90°. The Indanthrene-anthrasol-naphthol AS range of dyes may be used at 40–45° if the dye solution is preheated. If the temperature of the dye bath is below 40°, penetration

and uniformity of dyeing are poor, and the dyeing rate is reduced considerably. J. G.

667.22 = 3 1166

Dyeing mixtures of fibres containing wool and cellulose fibres at low temperatures. HAYNN, R. *Melliand Textilber.*, 24, *pp.* 266–268, *June*, 1943.—The simultaneous dyeing of such mixtures with direct dyes at low temperature is achieved by adding to the bath formic acid and Na_2SO_4 in suitable proportions; these increase the depth of shade on the wool and cellulose, respectively, to extents which are approx. proportional to the amounts added. Partial replacement of the latter by NH_4Cl gives improved results, but the presence of NaCl favours more rapid dyeing on to the wool. The economy in coal resulting from dyeing 100 kg. of fabric at 50°–60° instead of at 80°–90° is approx. 12 kg. J. G.

667.3 = 3 1167

Printing of formaldehyde-treated "zellwolle." KERTH, M. *Melliand Textilber.*, 24, *pp.* 233–234, *May*, 1943.—Base-printing gives satisfactory results with Naphthol AS without pretreatment, but Aniline black and Diphenyl black are, in general, unsatisfactory. Pretreatment with cold aq. NaOH for 30 min., followed by washing, improves printing by vat and Rapidogen dyes, and by Anthrosol dyes using the nitrite process. J. G.

667.3 : 541.182 = 3 *see Abstr.* 1103

669.018 : 541.123.3 *see Abstr.* 1045

669.1 : 621.315.52 : 539.4.016 1168

A study of work-hardening and re-annealing of iron. BALICKI, M. *J. Iron Steel Inst.*, 43 *pp.*, *Dec.*, 1944. *Advance Copy.*—An account of an investigation into the changes in properties of Armco-iron wires resulting from 12 different degrees of work-hardening, and subsequent annealing in a vacuum. The following properties were determined: Hardness, electrical resistivity, elastic limit, plastic limit, ultimate stress, uniform elongation, springiness, thermo-electric properties and microstructure. A survey of the changes induced by re-annealing confirms the presence of strain-ageing, recrystallization and crystal growth. The recrystallization occurs in the same range of temperatures; this suggests that all the changes are a result of the same fundamental cause. The recrystallization range is lowered when the degree of work-hardening is increased. Three regions of plasticity were distinguished.

669.14 : 541.123.2 = 6 *see Abstr.* 1043

669.14 : 621.937 : 539.4.016.2 *see Abstr.* 1033

669.143.1 : 621.785 : 536.48 *see Abstr.* 948

669.144 : 539.54 *see Abstr.* 1038

669.18 : [536.58 + 531.787 + 536.46] 1169

Physical control methods in the steel industry. BARR, W., AND PEARSON, T. F. *J. Sci. Instrum.*, 22, *pp.* 1–6, *Jan.*, 1945.—Special difficulties are discussed and desirable lines of research indicated. The methods include the use of thermocouples and radiation pyrometers for furnace temperature observation and control, various methods for the determination of flame quality, temperature control of soaking pit and heat-treatment furnaces, automatic reversal of furnaces, pressure control, measurement of flow of heater gas, combustion control. Rapid methods of analysis are outlined and some laboratory tests briefly described, such as the creep test and various special methods for the detection of local flaws. A. W.

674.049 : 539.24 1170

The microstructure of high-density plywood. HARLOW, W. M. *Mech. Engng, N.Y.*, 66, *pp.* 656–657, *Oct.*, 1944.—For microscopic examination, high-density plywood can be successfully sectioned by pretreatment in hot aq. 10% NaOH. The following is observed: (1) penetration of the resin is quite variable as between different samples, (2) usually the zone of greatest penetration is along the original surfaces of the veneer sheet, (3) in such cases, the greatest compression occurs near the centre of the sheet. A. M. T.

675.6 : 535.662 = 3 *see Abstr.* 928

676 : 532.68 *see Abstr.* 874

676 : 539.4.01 *see Abstr.* 1032

676.1 : 539.216.1 *see Abstr.* 1014

676.15 : 667.11 *see Abstr.* 1160, 1161

676.2.05 : 536.2 *see Abstr.* 937

677.21 : 667.11 : 539.216.1 *see Abstr.* 1012

677.3 : 539.216.1 *see Abstr.* 1015

677.3 : 541.182.6.058 = 3 *see Abstr.* 1112

677.31 : 667.2 = 3 *see Abstr.* 1164

677.46 : 539.217.3 *see Abstr.* 1019

678 : 539.31 *see Abstr.* 1027

678 : 539.388.8 *see Abstr.* 1031

678.7 : 541.128.1 *see Abstr.* 1075

679.5 : 536.468 1171

Flame resistance to thermosetting plastics. GALL, J. A., STEWART, R. W., AND ALFERS, J. B. *Bull. Amer. Soc. Test. Mater.*, *pp.* 23–27, *Dec.*, 1944.—Equipment and method of testing are described and results discussed. The difference in flammability characteristics, as imparted by the properties of the resin, type of filler and moulding technique, are sufficiently divergent and can be determined with sufficient accuracy to permit the establishment of limits of flammability. M.-

679.5 : 541.132 *see Abstr.* 1086

679.5 : 663.63 : 541.132 *see Abstr.* 1085

77.011 : 535.43 *see Abstr.* 918

771.35 : 535.317 *see Abstr.* 898

778 : 621.385 : 537.291 *see Abstr.* 974

781 : 534.3 *see Abstr.* 894